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THE NATION'S RECREATION  
OR  
POWER PRODUCTION AND FLOOD CONTROL:  
A STUDY IN LAND USE

by

WARREN ARTHUR POST  
B.Sc., Rutgers University, 1950

Presented in partial fulfillment  
of the requirements for the degree of  
Master of Forestry

MONTANA STATE UNIVERSITY  
1952

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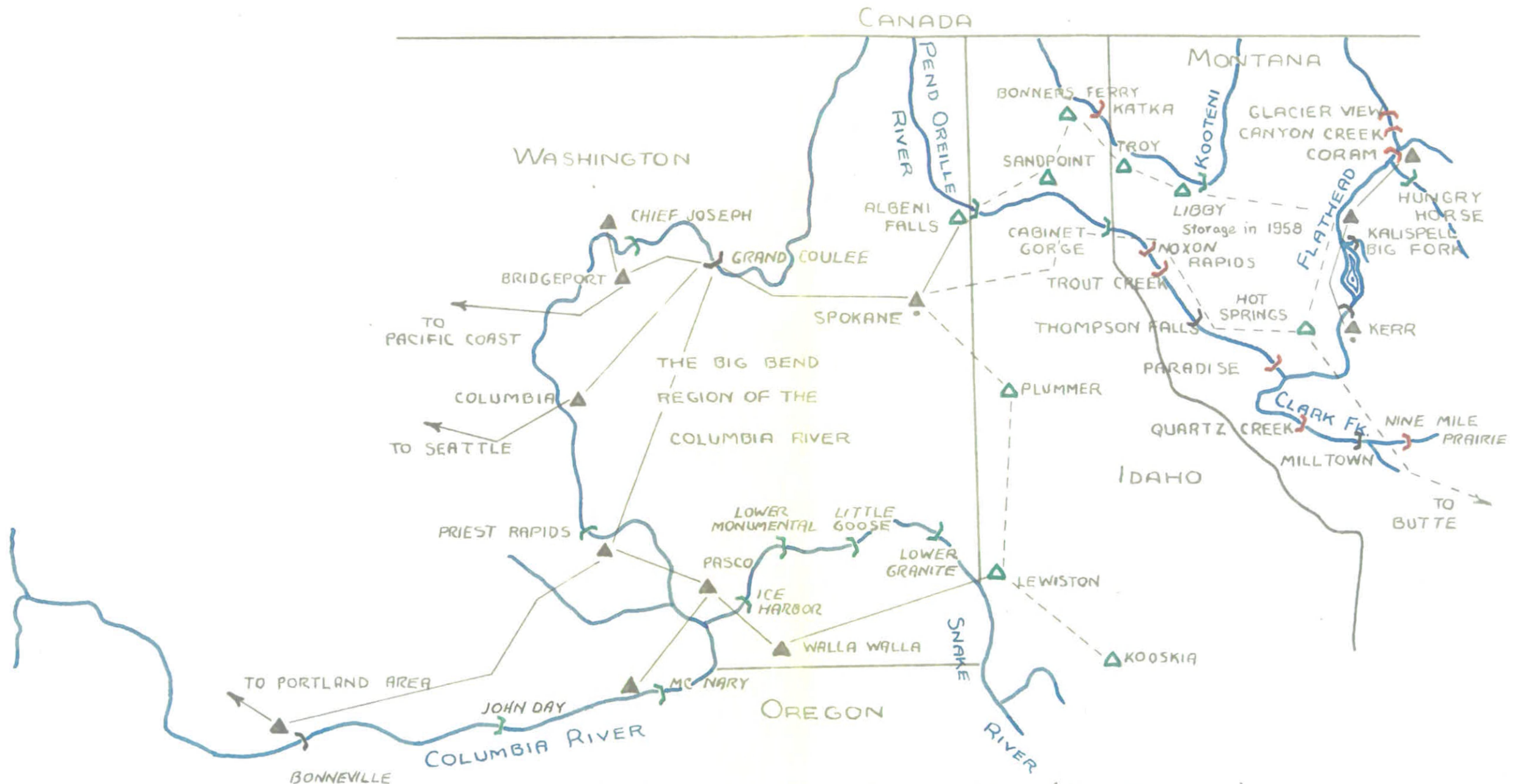
  
Chairman of the Board of Examiners

  
Dean of the Graduate School

Date May 29 1952









# MAP No. 1 COLUMBIA RIVER BASIN



MAP INCLUDES PROPOSED DAMS IN VICINITY OF GLACIER VIEW (SEE PLATE 10)  
AND THE BONNEVILLE POWER NETWORK

## LEGEND

-  EXISTING DAM AND HYDRO DEVELOPMENT
  -  DAM AUTHORIZED OR UNDER CONSTRUCTION
  -  PROPOSED DAM
  -  EXISTING TRANSMISSION LINE AND SUBSTATION
  -  APPROVED OR UNDER CONSTRUCTION
  -  INTERCONNECTIONS WITH OTHER UTILITY
- SCALE :  $\frac{3}{16}$ " = APPROX. 11 MILES

## PREFACE

Since the beginning of its colorful history, the Pacific Northwest has always been dependent upon water. The shipper needed it to drive his products to the factory. The industrialist needed it to generate power to remanufacture those products. The farmer needed it to supplement rainfall, to increase his acreages and production.

As the population increased, the need for water increased. Water power for factories; deep harbors for commerce; irrigation; municipal supplies; the needs for water were great. During World War I the great arid regions of the Columbia's Big Bend were utilized for dry land farming of wheat. For a time the farmers were successful, but soon soils dried out and lack of moisture led to smaller yields, poorer prices, eventual failure.<sup>1</sup> The answer was irrigation. With the construction of the Grand Coulee Dam and reservoir, the initial steps were taken. Other water impoundments followed. Great generating plants transmitted electrical energy to the far corners of the region. Inexpensive power brought industry. Irrigation brought the farmer.

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<sup>1</sup>Pacific Northwest Problems and Materials, (Portland, 1940), p. 19.

Then it was found that man needed still greater control of the rivers. Some seasons brought devastating floods, others brought periods of little water, intermittent power, brown-outs. The downstream structures needed more water for continual power production. They needed more for increased irrigation demands. They needed less in time of flood crests. The answer was the construction of dams in the high watersheds, the headwaters of the major rivers in the region.

In the fall of 1948, the Army Corps of Engineers made a detailed study of the Columbia River Basin and formed a comprehensive development plan. They studied possible sites for water impoundments throughout the entire length of all the major streams in the giant basin. The engineers found that the ideal location for most of these structures was in the high forested watersheds, mostly in the hands of the Federal Government as National Forests and Parks. This reasoning originated from the knowledge that these lands are mostly Government owned and areas to be included in the reservoir could be had at little cost. The upper mountain valleys also afforded the best location for these high concrete structures.

These Federal lands are already dedicated to management based on the "greatest good to the greatest number"<sup>2</sup> policy of the U.S. Forest Service, including water-

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<sup>2</sup>Department of Agriculture, Forest Service, The Use Book, A manual of Information About the National Forests, (Washington, Government Printing Office, 1918), p. 14.

shed management and erosion control. This policy causes some to feel these lands should be managed as originally planned. Such management would include cover planting, planned logging, greater fire control, and the construction of small catch basins. These steps would develop these high watersheds for flood control and save sinking the money into dams that might silt up in twenty to thirty years. Both ideas have merit.

One such structure proposed for immediate construction by the Corps of Engineers is the Glacier View Dam on the North Fork of the Flathead River in Flathead County, Montana. This dam will flood nearly 30,000 acres of Glacier National Park and the Flathead National Forest, backing water to within eight miles of the Canadian border.

This paper will deal with the various aspects of such a proposal and how they effect a given locality. Will they be a benefit or a detriment to the area? On what grounds should they be justified? Should the reasons be based on cost-benefit ratios, mathematical formulae, political commitments, moral obligations, or what? Should the final word be up to the people of the locality, their elected representatives, or the country as a whole? These are the questions that will be analyzed and discussed in this paper.

Such proposals have been made in the past and will undoubtedly be made in the future. This one case, here at Glacier View, may set a precedent for the evaluation of such proposals that may be presented to the people of en-

suing generations. It is hoped this paper will encompass all points and will evaluate them fairly.

The author is especially indebted to Prof. Tom C. Spaulding for his generous assistance and guidance throughout the entire work. He is also indebted to Ass't. Naturalist Don H. Robinson of Glacier National Park for his aid and suggestions in field research. To his wife, Lita, he is grateful for a critical reading of the manuscript and for the typing of the finished paper.

W. A. P.

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## CHAPTER I

### THE PROPOSAL

The proposed Glacier View Dam is an earth fill structure located on the North Fork of the Flathead River, mile 176.6, Sections 14, 15, 22 and 23, T 33 N, R 20 W. Geographically it is 11.5 miles northwest of the town of West Glacier, Flathead County, Montana. The reservoir formed by this structure will inundate 30,000 acres of timber, brush and meadowland, 19,450 acres of which lie within the exterior boundary of Glacier National Park.

The dam will be of the earthfill type, 416 feet high and 2,100 feet long, founded on the existing overburden. To reduce seepage, an impervious blanket from 15 to 60 feet thick and extending 4,000 feet upstream from the dam's axis will be constructed. The spillway will be of the side channel type, 485 feet long and 85 feet high. It is designed to carry a flow of 53,000 cubic feet per second which represents the probable maximum flood flow of the river. Drum gates, 16 by 60 ft., will control the spillway intake.

The power house will house three Francis-type turbines, rated at 99,000 horse-power each, operating at heads ranging from 253 to 399 feet. They will drive

three generators, rated at 70,000 KW each. The intake tower will be a 2,000 foot concrete lined tunnel, 30 ft. in diameter. This will divert the water to three steel penstocks, 18 ft. in diameter, leading to the turbines. The general operation plan is for drawdown from October through April and storage from May through September.

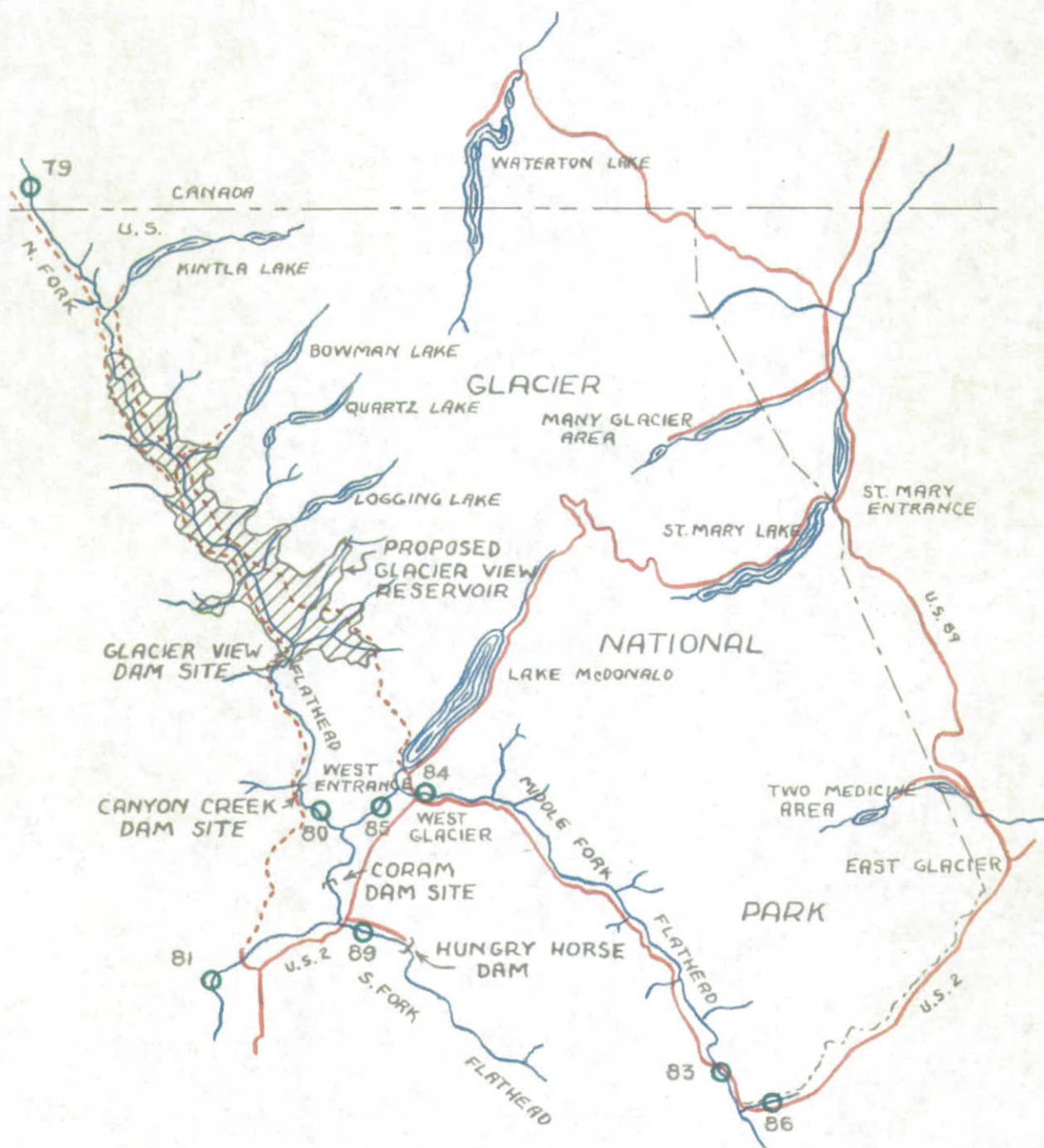
The reservoir backed up by this structure will have a gross capacity of 4,800,000 acre feet, of which 3,160,000 acre feet will be available for irrigation by the 35% drawdown. The remaining water is dead storage. The normal pool elevation will be 3725 feet; the minimum normal drawdown pool, 3587 feet; the minimum emergency drawdown pool, 3469 feet. The bed of the river is at 3324 feet, the crest of the spillway at 3709 feet. These elevations have been plotted on the river profile and panoramic photo of the damsite. These plates can be found following pages 2 and 19. All data in the preceeding paragraphs have been reported in the Army Corps of Engineer's Review Report on Columbia River and Tributaries of October, 1948.<sup>1</sup>

The valley of the North Fork of the Flathead, known locally as the North Fork, is a flat glaciated valley. extending about thirty-five miles to the Canadian border. It averages four to seven miles in width, bordered on the west by the Whitefish Range and on the east by the Contin-

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<sup>1</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, Clarke Fork-Pend Oreille River Basin, October 1, 1948, pp. 181-8.

# MAP No. 2



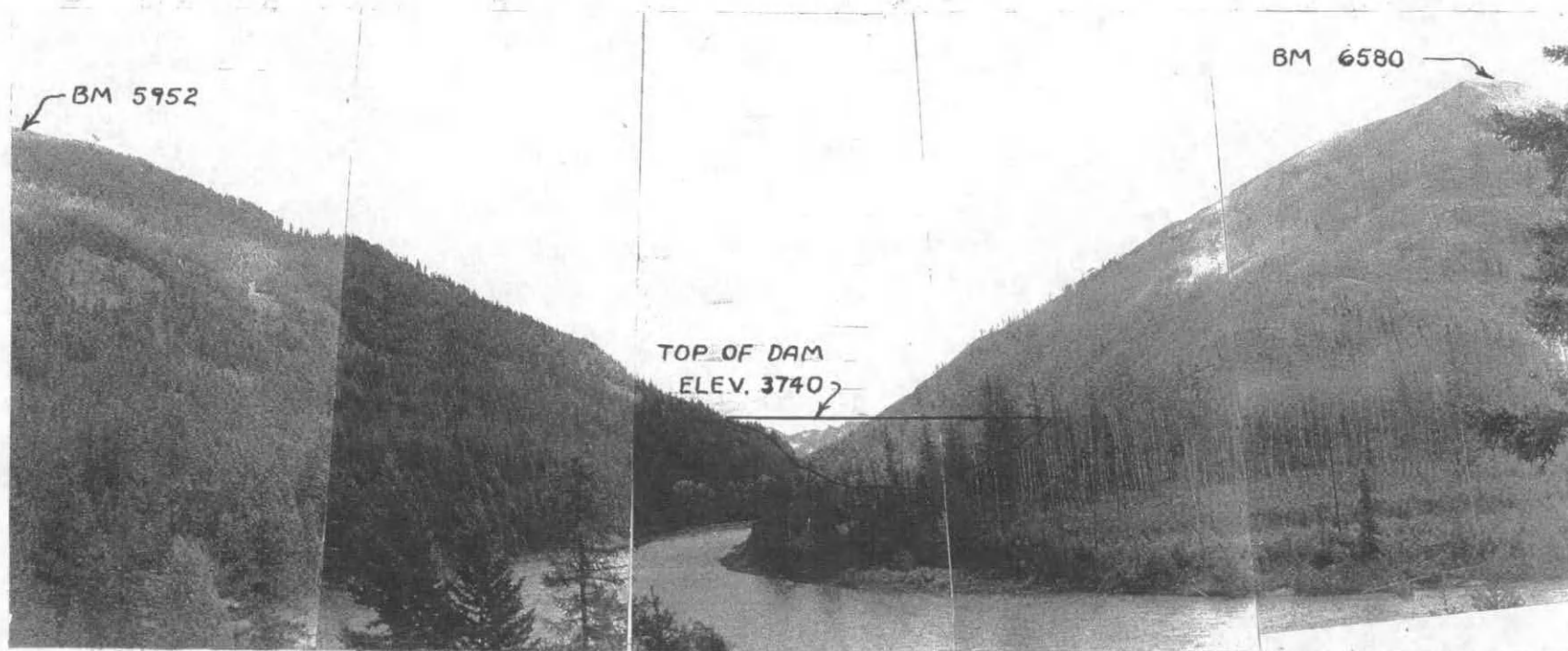
## GLACIER NATIONAL PARK SHOWING LOCATION OF GLACIER VIEW DAM AND RESERVOIR

### LEGEND

- PAVED OR FEDERAL HIWAY
  - SECOND CLASS (DIRT) ROAD
  - STREAM GAUGING STATION
- SCALE : 1/4" = 1 MILE

PLATE NO. 1

NORTH FORK OF THE FLATHEAD RIVER AT  
THE GLACIER VIEW DAMSITE



Looking Upstream During High Water

June, 1951

ental Divide. Robert S. Yard, in an article about Glacier,<sup>2</sup> described the park as two parks side by side. The eastern side with wild, precipiced and glaciated slopes, is elaborately scenic. This, Yard called the tourist side. The western side with broad, forested slopes and long lakes, is well populated with wildlife. This he termed the nature-lover side. This is the side of the North Fork, the side of the Glacier View Reservoir.

All of the major big game animals of North America are found in Glacier<sup>3</sup> and most of them winter in the North Fork drainages. The greatest concentrations of moose and white-tail deer are found there along with elk and mule deer. Beaver and the smaller fur bearers are found in all the streams. The caribou has also been reported in the valley.<sup>4</sup>

The North Fork valley contains much burned over and some virgin timber. About 8,000 acres of virgin forest, including some of the finest remaining stands of Ponderosa Pine existing in the Northern Rocky Mountains, are found within the flowage area alone. Logging has never been

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<sup>2</sup>Robert S. Yard, "Going to Glacier?" National Parks Magazine, No. 86, (July - September, 1946), p. 4.

<sup>3</sup>George C. Ruhle, Guide to Glacier National Park, (Minneapolis, 1949), p. 3.

<sup>4</sup>According to H. E. Anthony's Field Book of North American Mammals, the Mountain Caribou, Rangifer Montanus, has a range extending into northern Montana and Idaho. Prof. T. C. Spaulding of the Montana State University Forestry School reported killing a cow caribou in the upper North Fork valley in the summer of 1904.

carried out to any great extent and except for fire, little can be seen of man's influence. The North Fork country is the wilderness part of the park.

The North Fork is also considered to offer the finest stream fishing in Glacier. Fishing and sight-seeing trips down the river in rubber boats are conducted throughout the summer. These float and pack trips are carried out by private citizens with dude ranches in the valley.

The present roadway in the valley is a single lane semi-surfaced road. However, information in a recent letter<sup>5</sup> from the park indicated that the National Park Service has agreed to the building of a high standard road up the North Fork, following much the same route as the present one. At Polebridge, however, it will cross the river where it will eventually connect with the proposed road from Waterton Park. This loop road will furnish a very popular circle tour through the two parks and will eventually bring much heavier use to this North Fork area. Present development plans in the area include a cabin and campground development at Polebridge and enlargement of all the existing campgrounds, some up to 150 or more sites.

The Army Corps of Engineers has placed in high priority their proposed construction of the Glacier View Dam. It is recommended by the Engineers for major storage development to control floods, to add hydroelectric generat-

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<sup>5</sup>Don H. Robinson, personal letter, March 25, 1952.

ing capacity to the regional system at site and downstream, and to regulate the river flow for navigation and other water uses.<sup>6</sup>

In the next chapter these points will be supported.

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<sup>6</sup>Pertinent Facts About the Glacier View Dam Project, compiled at Park Headquarters, Glacier National Park, (West Glacier, Montana, n. d.), p. 1.



## CHAPTER II

### AN ANALYSIS OF THE LOCAL AND REGIONAL NEEDS

The construction of the Glacier View Dam has been proposed by the Army Engineers as it will result in many benefits to the local and regional territory. In addition to completing the control of floods in the Flathead Valley, it will be an important unit in the general control of floods at all points downstream on the Clark Fork and Columbia Rivers.<sup>1</sup> It will provide primary benefits of power and flood control and incidental benefits to irrigation, navigation, and recreation.<sup>2</sup> These are the reasons the Glacier View Dam has been included among the recommended projects in the Army Corps of Engineers Review Report on Columbia River and Tributaries. Let us now take up these points separately.

With 3,160,000 acre feet of live storage, the dam will completely control the North Fork of the Flathead River. Operation of Glacier View and Hungry Horse, now under construction by the Bureau of Reclamation on the

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<sup>1</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, Clarke-Fork-Pend Oreille River Basin, October 1, 1948, p. 187.

<sup>2</sup>Ibid., p. 191.

South Fork of the Flathead, will be closely coordinated. The two reservoirs will completely control the greatest known flood on the Flathead River, eliminating practically all damages in the vicinity of Kalispell and Flathead Lake, and will contribute substantially to the control of floods on the Clark Fork and the downstream reaches of the Columbia River.

Flood damage in the area of Kalispell, including the flood of 1948, has been serious. The Engineers report an estimated flood damage to Kalispell of \$141,300 annually.<sup>3</sup> The completion of Hungry Horse Dam will accomplish a substantial reduction in this flooding, but much of the area above Flathead Lake will still be subject to damage from larger floods. After careful study of all practical methods of flood control, it has been found that construction and operation of a dam on the North Fork of the Flathead River at the Glacier View Site would, in conjunction with Hungry Horse, completely eliminate all flood damage suffered in this area.<sup>4</sup> In the Bureau of Reclamation Report, The Columbia River,<sup>5</sup> of February, 1950, the following estimated

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<sup>3</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, op. cit., p. 187.

<sup>4</sup>Excerpts from a letter to the Hon. Mike Mansfield, House of Representatives, Washington, D. C. from Lt. Gen. R. A. Wheeler, Chief of Engineers, U.S. Army, January 17, 1949.

<sup>5</sup>Department of Interior, Bureau of Reclamation, The Columbia River, Final Letters of Transmittal and Comments of the Affected States and of Federal Lands, House Document 473, 81st Congress, Vol. 1, February, 1950, p.202.

flood control benefits appear:

Annual flood control benefits  
with the operation of Hungry Horse Dam . . . \$50,200

Annual flood control benefits  
with the combined operation of Hungry  
Horse and Glacier View Dams . . . . . \$63,000

This would indicate that the Glacier View Dam will contribute \$12,800 annually to flood control benefits. The Army Engineers place the benefits less conservatively at \$271,400 to local and \$367,600 to regional flood control benefits.<sup>6</sup> Accordingly, a reservoir on the North Fork has been included by the division engineer, North Pacific Division, as an element in his major plan for control of floods and other purposes in the Columbia River Basin.

The need for more power for industrial development, both on the Pacific Northwest and in Montana, has been recognized. Despite its very great water power resources, Flathead County has been obliged for some time to import electrical power to meet the needs of its population, and with any growth or industrial development, the county will be faced with an acute power shortage. At the present time hydroelectric power is generated only at a small plant of the Mountain States Power Company on the Swan River at Big-Fork. This plant is rated by the company at 4,150 kilowatts. To make up the deficiency between power generated at this plant and the total demand of its customers, the company

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<sup>6</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, October 1, 1948, p. IV - 44.

purchases additional energy from a hydroelectric plant in Lake County. In 1944 some 7,146,000 kilowatt-hours of energy had to be purchased at a cost of \$49,382.92 in this manner.<sup>7</sup>

Multi-purpose dams which would produce power along with other benefits have been proposed at various times for the North Fork, South Fork, and main Flathead Rivers. Hungry Horse, now under construction, will produce 285,000 kilowatts of electric power, to be distributed by the Bonneville Power Administration. As an isolated power project, Hungry Horse would not be economically feasible, but because of the benefits that will accrue to Grand Coulee and Bonneville Dams, as well as to future Federal dams on the Columbia, the project was authorized. The Bonneville Power Administration plans to interconnect the Hungry Horse generating facilities with the existing Federal high power transmission net. This will permit power to be either brought in or shipped out of western Montana. The generating facilities of Glacier View Dam are also scheduled to be included in the Bonneville Power Administration power network.<sup>8</sup>

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<sup>7</sup>George Sunborg, The Economic Base for Power Markets in Flathead County, Montana, Department of Interior, Bonneville Power Administration, Division of Industrial and Resources Development, Market Analysis Section, October, 1945, pp. 7-8.

<sup>8</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, op. cit., p. 174.

The Glacier View Project calls for a generating capacity of 210,000 kilowatts. This power will be developed by three 70,000 KW generators. With the addition of the facilities proposed at Canyon Creek and Coram, the total output will be 440,000 kilowatts. Canyon Creek and Coram are two run-of-the-river hydroelectric plants that will be built in conjunction with Glacier View, several miles downstream from the dam (See Map No. 2). Neither project would be economically feasible, however, until the completion of Glacier View provided the upstream storage.<sup>9</sup> Both are nevertheless included in the original proposal.

This power potential, 440,000 KW, will then be connected with the Bonneville Power Network to be distributed either statewide or regionwide. This power potential might be developed into an industrial lure for the Kalispell area, particularly in a time of defense and military expansion.

The outlook at Kalispell for wood products remanufacturing is encouraging. The outlook for success for a pulp and paper venture in this area is probably the best it has ever been.<sup>10</sup> With the introduction of cheap power, several new industries may become established in the Flat-head valley region. An aluminum plant has already been

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<sup>9</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, op. cit., pp. 256, 266.

<sup>10</sup>Sunborg, op. cit., pp. 24, 26.

PLATE NO. 2

NORTH FORK OF THE FLATHEAD RIVER AT  
THE CANYON CREEK DAMSITE



Looking Upstream During  
High Water, June, 1951

proposed in this area because of its close proximity to vast sources of inexpensive power. These points weigh favorable for the construction of Glacier View Dam and its resulting hydroelectric plant.

With 3,160,000 acre-feet of usable storage, the Glacier View Reservoir will supply incidental irrigation benefits to the Kalispell area. Various estimates have been made of the increased income and population which will result from the coming of irrigation to Flathead County. Census data on comparable areas would indicate that an overall county production increase of at least one-third can be expected.<sup>11</sup> The Kalispell Project, involving some 85,000 acres north of Flathead Lake, is one of the expansion plans. Water for this plan will be supplied by Hungry Horse Dam, either by gravity flow or pumping. Other additional lands available for irrigation are listed in Table I on the following page.

There are 191,508 acres of land receiving water from existing developments such as Mission, Pablo, and Ninepipes Reservoirs. The additional 55,539 acres could be set up for irrigation with water from Glacier View.

In addition to storage for local irrigation, the waters behind Glacier View can be released whenever the levels in downstream reservoirs become dangerously low. When water levels at Grand Coulee or Bonneville drop during

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<sup>11</sup>Sunborg, op. cit., p. 57.

TABLE I

LAND IRRIGABLE UNDER EXISTING WORKS <sup>12</sup>

	Irrigated	Additional Irrigable	Total
Flathead River Basin:			
Upper Flathead Valley	2,000	0	2,000
Lower Flathead Valley	74,030	22,540	96,570
Little Bitterroot Valley	8,860	1,590	10,450
Flathead Indian Reservation:			
Camas	10,461	2,709	13,170
Jocko	9,371	3,994	13,365
Mission Valley	<u>86,786</u>	<u>24,706</u>	<u>111,660</u>
Total	191,508	55,539	247,215

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<sup>12</sup>Department of Interior, Bureau of Reclamation, The Columbia River, op. cit., pp. 199, 201.



the dry summer months, these upstream dams can release stored water to alleviate this condition. This will tend to smooth over the fluctuating power operation caused by seasonal rainfall variation. With such operation, Glacier View has both local and regional storage benefits.

The Glacier View project is considered as an element of the main control plan because of its many advantages over other sites in the entire Columbia River Basin. Nearly all of the reservoir area is covered with second growth, brushy fir and lodge-pole pine. Flowage costs will be relatively low. There are only thirty-eight privately-owned homes, a store, six Park or Forest Service building groups, forest roads, telephone lines and minor mineralized but undeveloped areas in the reservoir area.<sup>13</sup> Relocation of 51.21 miles of road and 45.22 miles of phone line has been planned.<sup>14</sup> Table II on the next page shows the present use of the reservoir lands.

The stumpage value of the merchantable timber within the flow line is reported at \$228,000 of which \$74,000 is in Federal hands.<sup>15</sup> Then \$154,000 is the value placed on state and private timber holdings.

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<sup>13</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, October 1, 1948, p. IV - 42.

<sup>14</sup>Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, op. cit., p. 185.

<sup>15</sup>Ibid., p. 184.

TABLE II

PRESENT USE OF RESERVOIR LANDS<sup>16</sup>

Land Use	Private	State of Montana	Glacier N.P.	U.S. For.	Ser.	Total
Cultivated	736					736
Prairie or Pasture	871	265	383			1,519
Home Sites	230					230
Grazing or Timber	7,592	7,281	10,332	2,241		27,446
	9,429	7,546	10,715	2,241		29,931

The tax loss to Flathead County on these private lands within the reservoir amounts to \$4,000 annually. The payment of this loss is included in the annual charges against the project so it will not effect the county financially.

In all, the losses incurred by the construction of the project are few. Little privately owned land, no cities, and no industries have to be relocated.

The Army Engineers place the annual recreational benefits accruing from the project at \$60,000.<sup>17</sup> This is probably calculated from the results of similar reservoir areas elsewhere. The construction of a first class road to the dam site would permit easy access to the project works. This would attract many tourists during and after completion of the project. This in turn would bring more revenue to businesses dependent on tourist trade.

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<sup>16</sup> Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, Appendix C, op. cit., p. 185.

<sup>17</sup> Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, October 1, 1948, p. IV - 44.

The creation of a twenty-four mile long reservoir several miles wide has been considered by some as an ideal fire break. Any fires originating west of the reservoir would be effectively stopped by such a body of water. During the summer of 1929, one of the most disastrous fires in the history of Glacier originated outside of the park. Fanned by a strong wind it jumped the Flathead River and burned several thousand acres of virgin timber before being controlled. Although fire fighting techniques have improved greatly in the past fifteen years, such an artificial fire break could be an asset in the park's fire plan.

Intangibles, such as national security, loss of life, improved standards of living, and stabilization of business employment over a long period will be impressive by-products of this development. No attempt is made to evaluate these factors in monetary terms, because any one may be so far-reaching under certain conditions that accurate segregation and measurement become impracticable. Nevertheless, a number of these factors constitute potent arguments for the development of the valuable water resources now largely wasted, and far outweigh the few minor disturbances of local economy with resources of lesser significance that cannot be avoided.<sup>18</sup>

We might conclude this chapter with a summary of the

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<sup>18</sup> Department of the Army, Corps of Engineers, Review Report on Columbia River and Tributaries, October 1, 1948, p. III-40.

estimated annual benefits in tabular form, as presented by the Army Corps of Engineers. These tables may be found on the following page.

From these tables the benefit-cost ratio has been calculated as 1.84 to 1. This is considered by the Army Engineers as very favorable, making the Glacier View project highly desirable as a major storage development.

In the following chapter we will consider those points in opposition to this recommended project.

TABLE III

ESTIMATED ANNUAL BENEFITS,  
GLACIER VIEW PROJECT<sup>19</sup>

Item	Est. Annual Benefit
Local Flood Control . . . . .	\$ 271,400
Regional Flood Control . . . . .	367,600
Navigation . . . . .	16,000
Power . . . . .	7,773,000
Recreation . . . . .	60,000
Total Benefits . . . . .	<u>\$8,488,000</u>

TABLE IV

SUMMARY OF CAPITAL COSTS AND ANNUAL CHARGES,  
GLACIER VIEW PROJECT<sup>20</sup>

Item	Capital Cost
Estimated first cost . . . . .	\$ 94,962,000
Interest during construction . . . . .	<u>7,122,000</u>
	<u>\$102,084,000</u>

Item	Annual Charge
Interest . . . . .	\$3,063,000
Amortization . . . . .	905,000
Project operation and maintenance . . . . .	567,000
Interim replacements . . . . .	70,000
Payments in lieu of taxes . . . . .	<u>4,000</u>
	<u>\$4,609,000</u>

Annual Charges \$4,609,000  
Annual Benefits \$8,488,000

Benefit to cost ratio of 1.84 to 1

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<sup>19</sup>Department of the Army, Corps of Engineers,  
Review Report on Columbia River and Tributaries,  
October 1, 1948, Table IV-10, p. IV-44.

<sup>20</sup>Ibid.

### CHAPTER III

#### AN ANALYSIS OF THE EFFECT ON THE SOCIAL AND ECONOMIC FACTORS OF THE AREA

The Glacier View Dam project proposed by the Army Corps of Engineers presents a serious threat to Glacier National Park and to those very values which the National Park Service is obliged by law, and expected by the public, to protect.

Appraisal of the potential damage of the proposed project requires a knowledge of the area which would be flooded, as well as the area adjacent to the impounded water. The North Fork of the Flathead flows along the west side of the comparatively level trough known as the Upper Flathead Valley. The west side of the valley rises abruptly from the river while the east side rises gradually for some seven miles and terminates along the Continental Divide.

Nestled in the bottoms of the U-shaped valleys at middle elevation on the park side are four large lakes. Along the shores of two of these lakes are primitive type campgrounds, accessible by a narrow truck trail. Camping there is only for the hardy visitor who forsakes the comforts of crowded hotels or developed campgrounds for an

exhilarating experience in wild and spectacular scenery.

Beyond these lower lakes, trails lead into the "high country." This is the region of cascading streams, mountain lakes, towering cliffs, alpine meadows, persistent glaciers, lofty peaks, and many unusual species of birds and mammals. Wildlife, lakes, high country; these are parts of this wilderness. It is fragile and primitive and must be wisely used by this generation so it can be passed on unspoiled to future generations.

It is in this area that the Army Engineers have recommended the construction of the Glacier View Dam and resulting reservoir.

The reservoir will inundate nearly 30,000 acres of this valley, 19,450 of which lie within the boundary of Glacier National Park. Several maps have been included in this paper to present to the reader a clearer picture of the resulting situation.

Map 2, following page 2, shows the location of the reservoir in respect to the entire park. Map 3, following page 19, gives a better picture of the immediate area in and around the reservoir. This map, in conjunction with Plate 3, the river profile, will give the reader a clear picture of what will happen when the water level fluctuates due to the demands of the powerhouse. With the normal drawdown of 138 feet, mud flats nearly six miles long and up to two miles wide would be exposed. The water in many places along the shore would be one-half to three-quarters of a

MAP No. 3

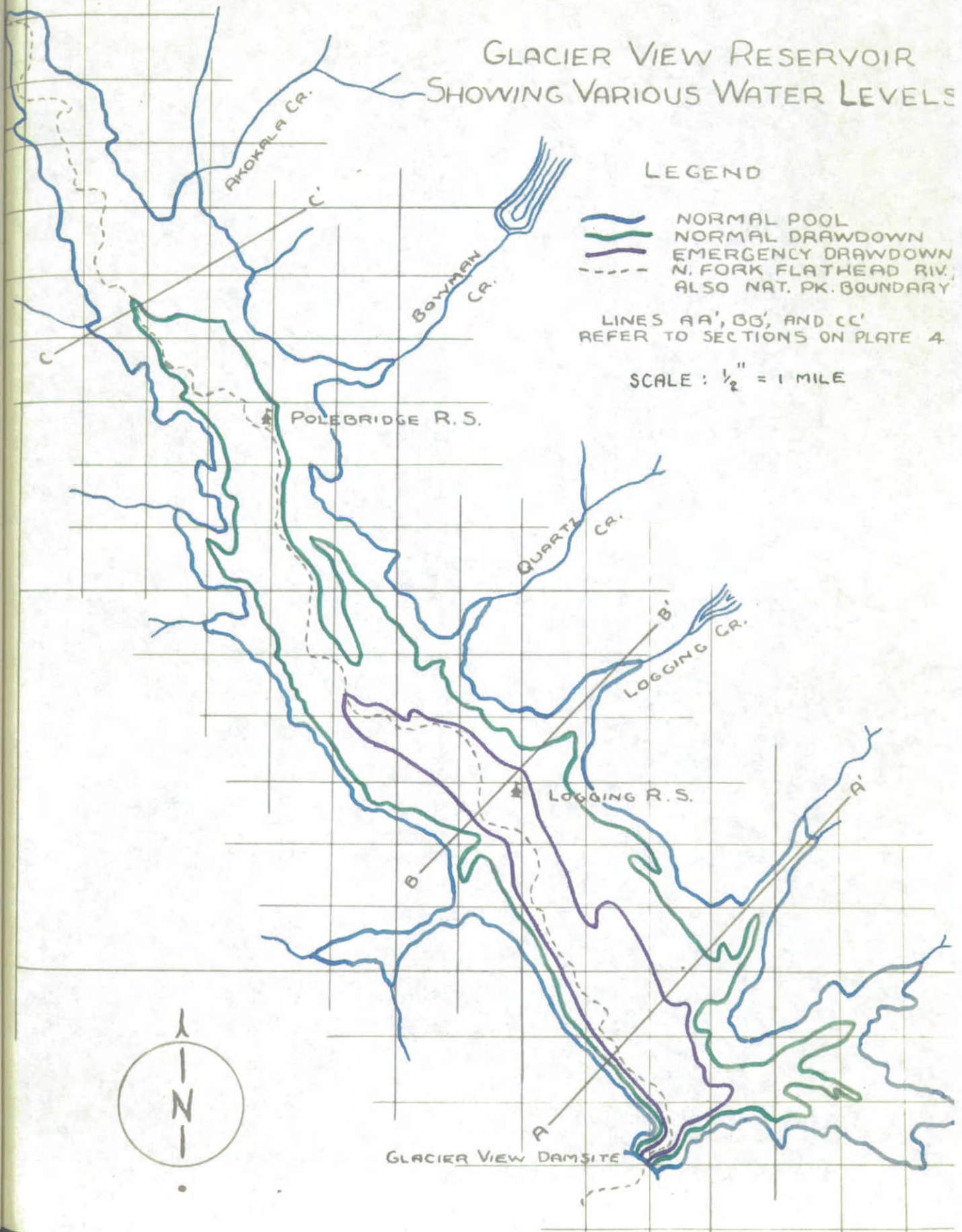
# GLACIER VIEW RESERVOIR SHOWING VARIOUS WATER LEVELS

## LEGEND

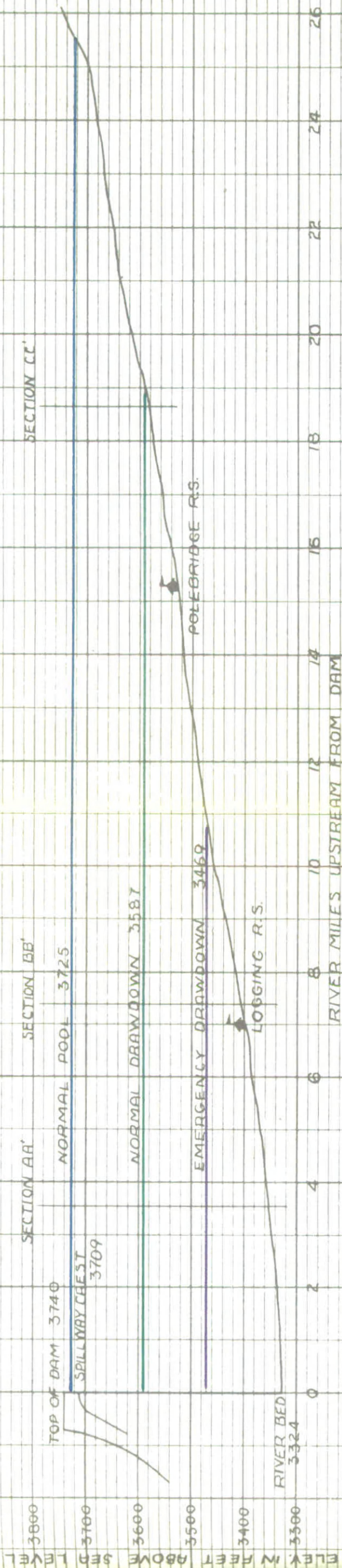
- NORMAL POOL
- NORMAL DRAWDOWN
- EMERGENCY DRAWDOWN
- N. FORK FLATHEAD RIV.  
ALSO NAT. PK. BOUNDARY

LINES AA', BB', AND CC'  
REFER TO SECTIONS ON PLATE 4

SCALE :  $\frac{1}{2}$ " = 1 MILE







# PROFILE OF N. FORK FLATHEAD RIVER SHOWING RESERVOIR AT VARIOUS WATER LEVELS

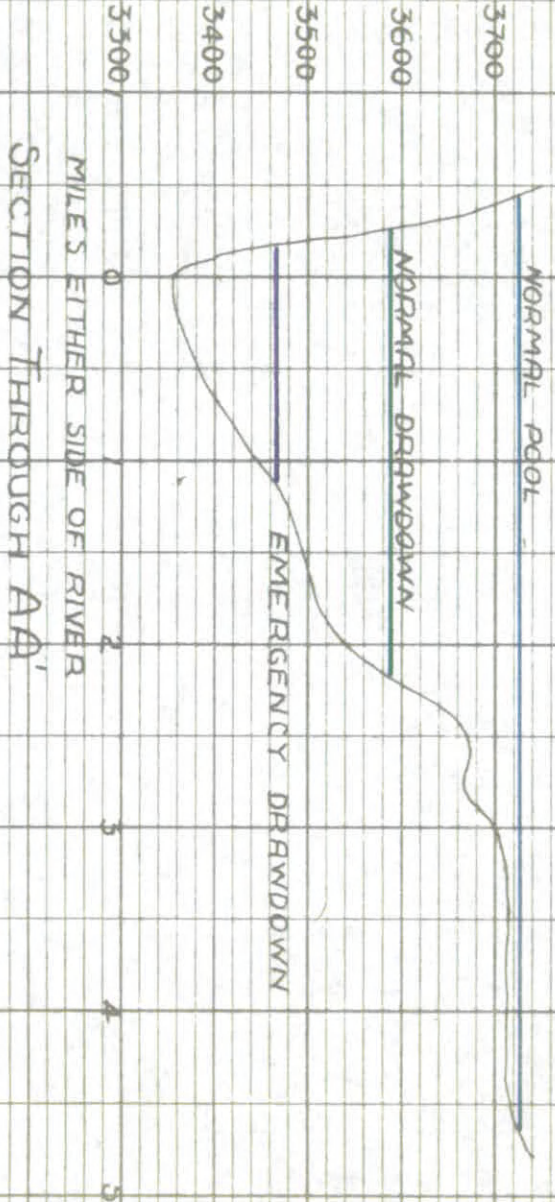
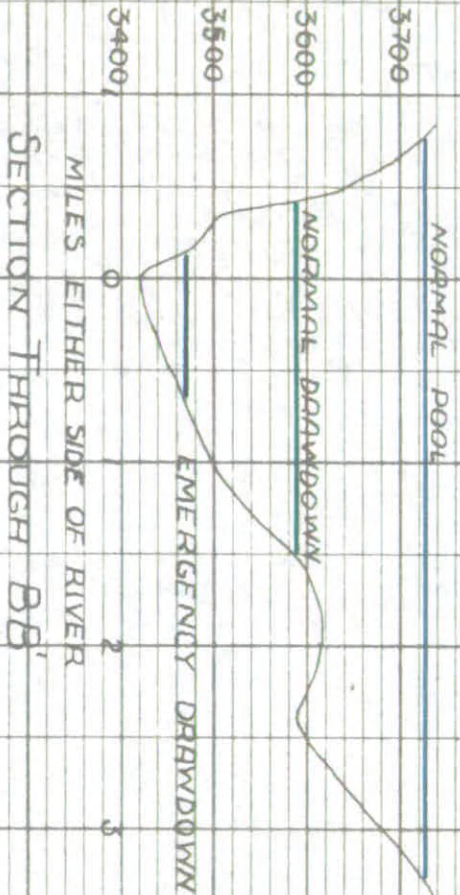
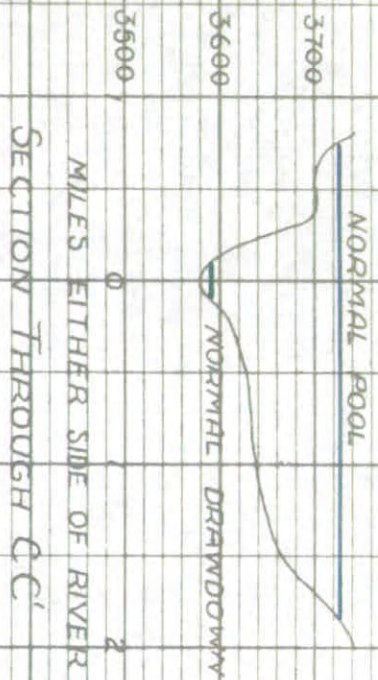
SECTIONS AA', BB' AND CC' THROUGH THE RESERVOIR  
MAY BE FOUND ON PLATE NO. 4

WITH NORMAL DRAWDOWN, OVER FIVE MILES OF MUD FLATS  
AND LAKE BOTTOM WILL BE EXPOSED AT THE UPPER END OF THE RESERVOIR

WITH AN EMERGENCY DRAWDOWN, OVER TWELVE MILES OF  
LAKE BOTTOM WILL BE EXPOSED AT THIS UPPER END



PLATE No. 4



# SECTIONS THROUGH RESERVOIR SHOWING VARIOUS WATER LEVELS

MILE ZERO INDICATES CENTER OF FLATHEAD RIVER;  
ALSO GLACIER NATIONAL PARK BOUNDARY

mile from the maximum shore line. It doesn't take much imagination to picture the situation in that area after a period of a few dry years. Plate 4 shows several cross-sections through the reservoir at points indicated on Map 3. In certain areas mud flats over two miles in width are exposed. With the drawdown occurring in the fall and winter, these flats will be exposed when conditions are, at their best, poor for any type of vegetative growth. This is hardly the situation that should be prevalent in a wilderness area.

Glacier, in addition to being one of the nation's foremost scenic wilderness areas, presents one of the finest spectacles of native wildlife in the United States. Every big game species native to temperate North America may be found in the park with the exception of bison and antelope, both of which are believed to have formerly lived in the park.<sup>1</sup> Grizzlies, black bear, moose, elk, white-tail deer, mule deer, mountain sheep, and mountain goats are all represented in good number.

Construction of Glacier View Dam would be very damaging to park animal life. The available summer range is sufficient. The limiting factor is the winter range for heavy winter snows make a sharp division of seasonal ranges for the ungulates. Generally the winter range is

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<sup>1</sup>Statement in Opposition to the Glacier View Dam,  
Prepared at Glacier National Park, (West Glacier, Montana,  
July 27, 1948), p. 1.



MAP No. 4

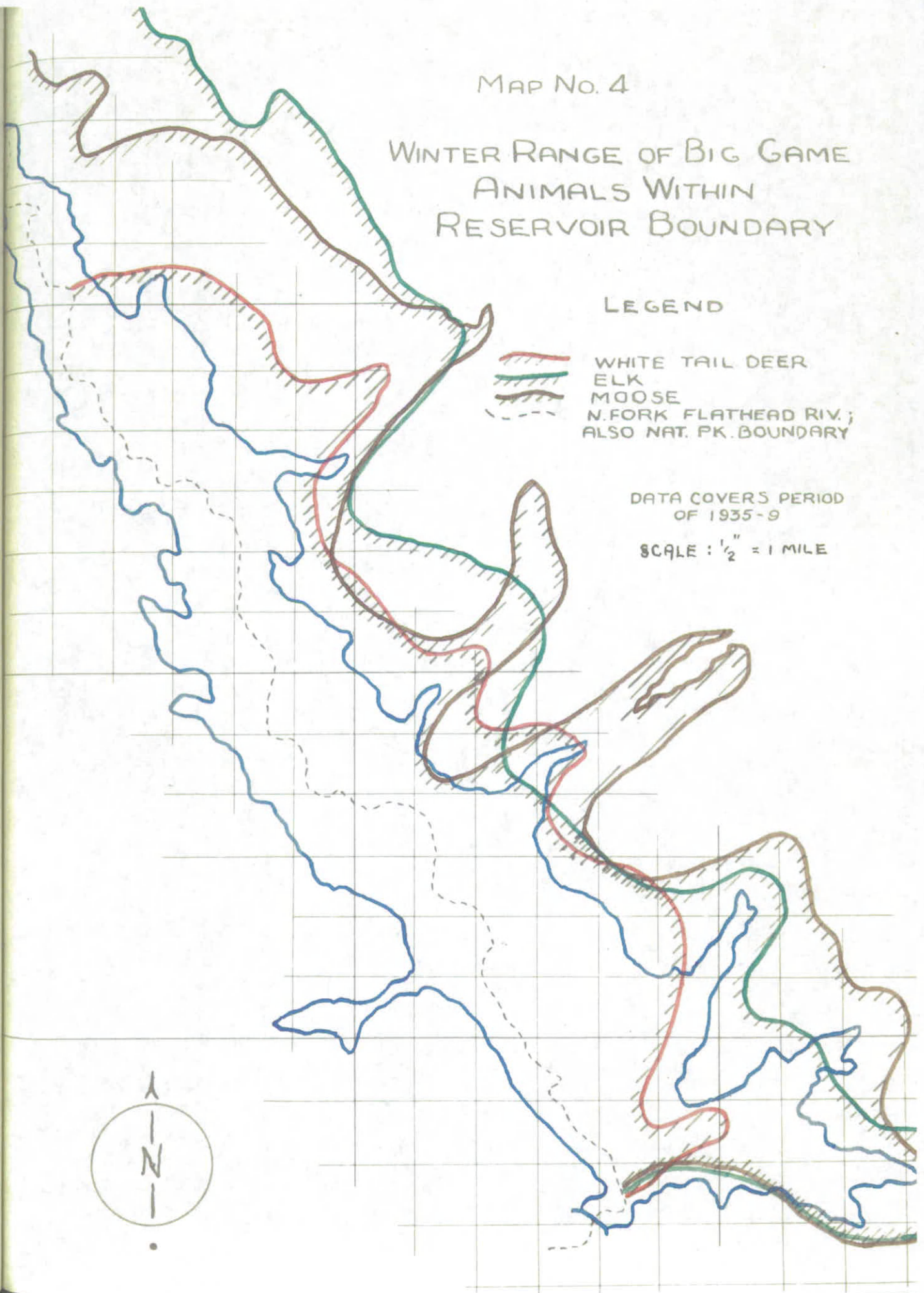
WINTER RANGE OF BIG GAME  
ANIMALS WITHIN  
RESERVOIR BOUNDARY

LEGEND

 WHITE TAIL DEER  
 ELK  
 MOOSE  
 N.FORK FLATHEAD RIV.;  
ALSO NAT. PK. BOUNDARY

DATA COVERS PERIOD  
OF 1935-9

SCALE :  $\frac{1}{2}$ " = 1 MILE



MAP No. 5

RANGE OF SMALL FUR BEARERS  
WITHIN RESERVOIR BOUNDARY

LEGEND

○ ACTIVE BEAVER COLONY  
MARTEN  
N. FORK FLATHEAD RIV.;  
ALSO NAT. PK. BOUNDARY

DATA COVERS YEARS 1937-8  
PLUS 1951 REVISIONS

SCALE :  $\frac{1}{2}$ " = 1 MILE



inadequate.<sup>2</sup> The 19,450 acres that would be flooded represents the most critical part of the winter range in the park. This is especially true in the case of the elk, white-tail deer, and moose. It is estimated that 60 to 70% of white-tail deer winter range; 30% of elk and mule deer winter range; and 70 to 80% of the moose range would be destroyed by the reservoir.<sup>3</sup> In addition, about 70% of the beaver population on the west side of the park would be flooded out.<sup>4</sup> Muskrat and other small fur bearers would likewise suffer. Maps 4 and 5 show some of the wildlife ranges in respect to this situation.

The Army Engineers report that the valley is covered with second growth brushy fir and lodge-pole pine, poor feed for wildlife at its best. However, reports from three game ranges in the immediate vicinity indicate that Douglas-fir is used extensively as deer and elk browse, especially on poorer ranges. At Big Prairie in the South Fork of the Flathead, Douglas-fir reproduction was reported as having been heavily utilized by elk during former winters.<sup>5</sup>

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<sup>2</sup>The Status of Wildlife in the United States, Report of the Special Committee on the Conservation of Wildlife Resources, Senate Report No. 1203, February 13, 1940, p.371.

<sup>3</sup>Pertinent Facts About the Glacier View Dam Project, Compiled at Park Headquarters, Glacier National Park, (West Glacier, Montana, n. d.), p. 2.

<sup>4</sup>Statement in Opposition to the Glacier View Dam, op. cit., p. 2.

<sup>5</sup>Merele J. Rognrud, "Flathead-Sun River Unit, Early Spring Inspection, S. Fork Flathead River," Montana Fish and Game Commission Quarterly Report, (April-June, 1948), p.159.

Pictures of "high lining" by deer on Douglas-fir was reported in Lincoln County.<sup>6</sup> White-tail deer in the Swan River valley were reported favoring willow heavily, along with Douglas-fir and yew.<sup>7</sup> Although different game ranges vary greatly in forage use, these preceeding areas, all adjacent to the area in question, report heavy use by game on this brushy fir.

Elimination of this vital winter range would force most of these animals to migrate or perish. Since the only suitable remaining winter range areas are already overstocked, any migration of game would eventually result in loss of a major portion of the park animal life.

Another cause for concern in the flooding of this area is the resulting loss of the only virgin stands of ponderosa pine to be found in the park. Construction of the dam would result in the destruction of approximately 8,000 acres of timber. These virgin stands are essential elements of the natural beauty of this wilderness area. Of the 8,000 acres, over 2,000 acres are mature virgin ponderosa pine, representing one of the finest remaining stands of this species in the Northern Rocky Mountains. Nearly 1,500 acres of this timber type will be immediately destroyed by

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<sup>6</sup>Ade Zajanc, "Lincoln County Game Study, 1947-8," Montana Fish and Game Commission Quarterly Report, (April-June, 1948), p. 18.

<sup>7</sup>Merele J. Rognrud, "Investigation of the White-tailed Deer in the Swan River," op. cit., (October-December, 1950), p. 43.



# MAP No. 6

## MAJOR TIMBER TYPES WITHIN RESERVOIR BOUNDARY

### LEGEND

- 2 PONDEROSA PINE
- 3 LARCH-DOUGLAS FIR
- 5 DOUGLAS FIR
- 6 ENGELMAN SPRUCE
- 7 LODGEPOLE PINE
- 10 BLACK COTTONWOOD
- 11 SUBALPINE
- 18 GRASS
- 19 BRUSH
- 21 PASTURE

--- N. FORK FLATHEAD RIV.;  
ALSO NAT. PK. BOUNDARY

W- WELL STOCKED  
M- MODERATELY STOCKED  
P- POORLY STOCKED  
a- POLES  
b- SEEDLINGS

SCALE :  $\frac{1}{2}$ " = 1 MILE

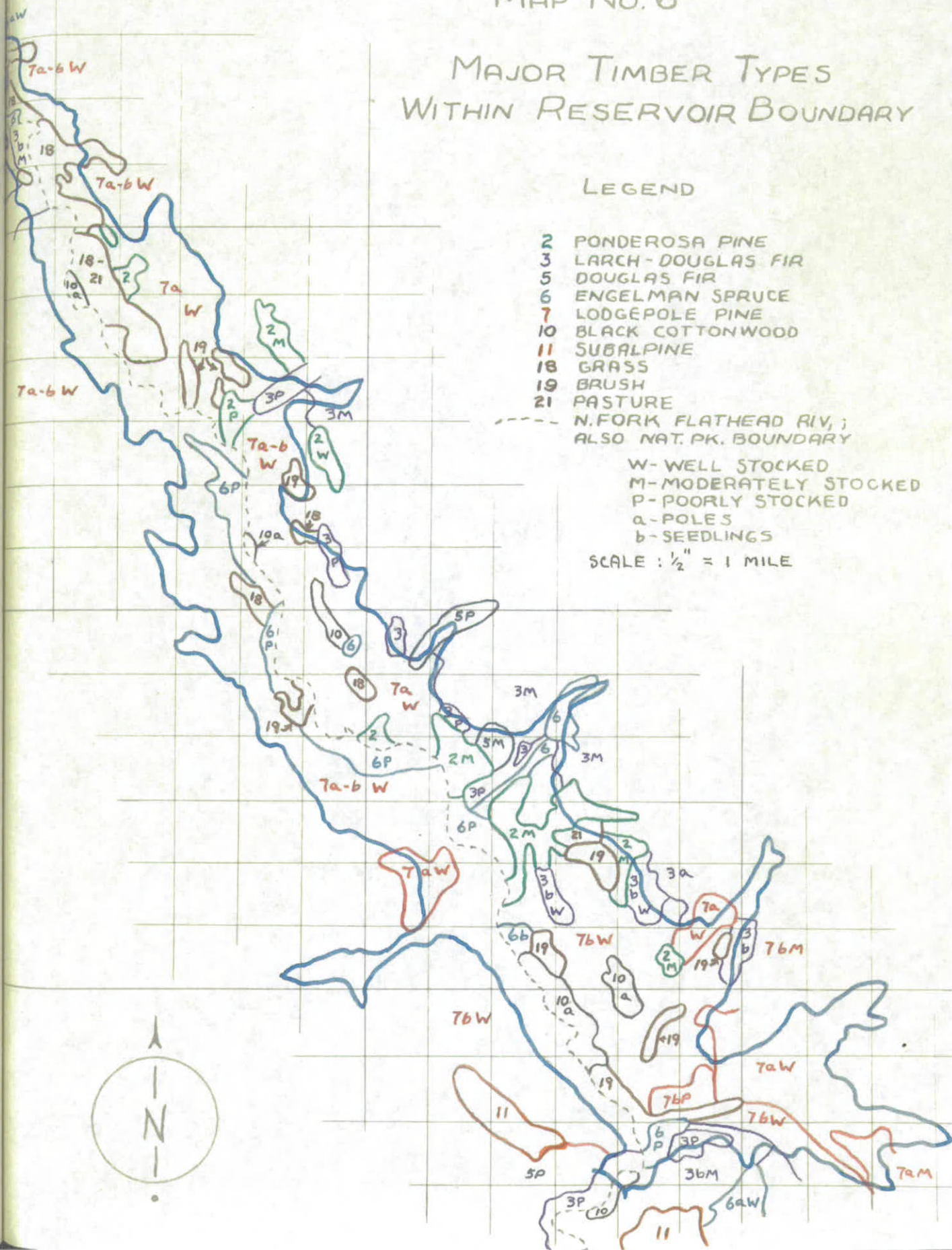




PLATE NO. 5

PONDEROSA PINE  
IN THE NORTH FORK VALLEY



Part of Area  
Within Reservoir Boundary

direct flooding. The remaining 500 acres will eventually die off from the change in site.<sup>8</sup> Of these 2,026 acres of pine, 1,139 acres are on park lands. The remaining 887 acres are part of 9,354 acres of State of Montana lands within the park boundary.

The State of Montana acquired these lands in lieu of losses to its grant for common school and capitol building purposes by reason of the creation of Glacier National Park. Lieu selections were made during the period following the establishment of the park, being completed sometime in the 1920's. Several attempts were made to arrange for the exchange of these holdings for lands of equal value outside the park on the public domain. These attempts, extending into the early 1940's, met with no success. One of the latest attempts, HB 62,<sup>9</sup> permitting the outright sale of these lands to Glacier Park, ended in committee. The latest attempt, permitting exchange of the lands for grazing lands in eastern Montana is still pending.

The lands were selected primarily on the basis of their outstanding forest cover. Ponderosa pine, larch, Douglas-fir, and lodge-pole pine comprise the merchantible species. The encroachment of logging and settlement in the

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<sup>8</sup>This point was brought out in discussions with Paul D. Kemp of the Forest Resources Department at the Missoula Regional Office of the U.S. Forest Service. He feels the increase in moisture with the formation of this large body of water will eventually destroy those trees not flooded out immediately.

<sup>9</sup>House Bill 62, Montana Legislature, February, 1951.

vicinity of the park is rapidly resulting in the park becoming a small island supporting an outstanding example of the nation's unspoiled heritage. The damage that would occur if logging was permitted, even under the most rigid restrictions, would irreparably destroy the wilderness aspect of this region, placing it in a category common to the vast areas of logged-over lands in the west.

The appraised value of the land and timber is \$520,600.<sup>10</sup> This figure was obtained by a party of forest consultants to determine the price for outright sale of the lands to Glacier. This is the value placed on the entire 9,354 acres of state lands. The Glacier View Reservoir would flood 5,524 acres or nearly 60% of these state lands. Assuming equal distribution of the timber, this flooded land would be worth \$322,360. This more than doubles the Army Engineer's estimated value of \$154,000 for all state and private holdings within the reservoir.

The need for preserving these state-owned lands in a national park status is readily apparent when it is realized that the drawing power of the park is responsible for nearly all of the tourist business in the Flathead valley. This same basic reasoning should be used when evaluating the loss of this whole area to the people of Flathead County or to all the people of the United States.



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<sup>10</sup> State of Montana Lands in Glacier National Park,  
(Prepared in Glacier National Park, West Glacier, Montana),  
n. d., p. 3.

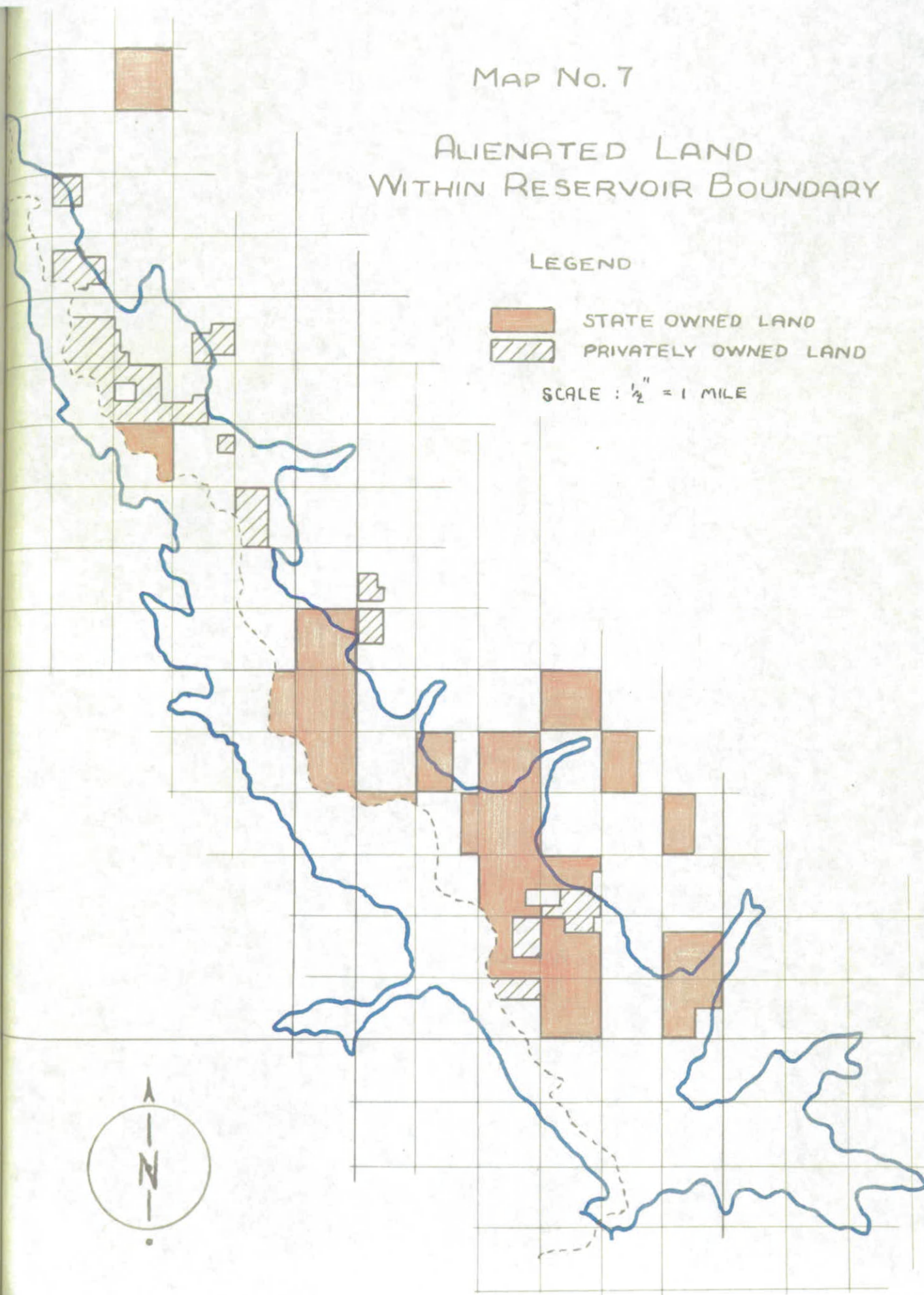
MAP No. 7

# ALIENATED LAND WITHIN RESERVOIR BOUNDARY

## LEGEND

-  STATE OWNED LAND
-  PRIVATELY OWNED LAND

SCALE :  $\frac{1}{2}$ " = 1 MILE



The justification for this dam, probably the basic reason which has been stated most consistently, is its need for flood control. The recent 1948 flood disaster in the Flathead Valley and along all tributaries of the Columbia River is being used as the major argument.

The dam is designed as a flood control measure, yet it is significant to note from the Corps of Engineers' estimates of annual benefits that approximately 91% of these relate to power production, 3.2% and 4.3% relate respectively to local and regional flood control and the remaining small percentages to navigation and recreation.<sup>11</sup>

The Army Engineers' report, Review Report on Columbia River and Tributaries, implies that the dam would offer far greater control of flood flows between Columbia Falls, Montana, and Portland and Vanport, Oregon, than analysis can show. The proposed capacity of 4,800,000 acre-feet would be 34% of the 14,000,000 acre-feet of storage which the Pacific Northwest Coordination Committee considers essential to keep Columbia River flows at The Dalles below 800,000 cubic feet per second, the channel capacity. The North Fork, during the month of peak flood, has never been recorded at more than 1,000,000 acre-feet, or 7% of the required storage, and the recorded floods have occurred too late to be significant factors in the flood crests at The Dalles and Portland. The

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<sup>11</sup> Data from a letter to the Honorable Mike Mansfield, House of Representatives, Washington, D.C., from Julius A. Krug, Secretary of Interior, Washington, D.C., April 6, 1949.

table below will show the significance of water from the North Fork in the flow at The Dalles, Oregon.

TABLE V  
SIGNIFICANCE OF WATER FROM NORTH FORK IN THE  
FLOW AT THE DALLES, OREGON<sup>12</sup>

	<u>May 31, 1948</u>	<u>June 13, 1948</u>
Total peak flow at The Dalles	1,010,000 s.f.	967,000 s.f.
Probable flow from N.Fork	11,127 s.f.	19,700 s.f.
Percent of total flow originating on N. Fork	1.1 %	2.0 %
Depth of water created by flow from N. Fork	3.8 in.	6.75 in.
Pressure created on channel sides by water from N. Fork	2.2 oz.	3.9 oz.
Flow time between The Dalles and Vanport is 18 hours.		

The peak flow at The Dalles occurred on May 31. The flood peak on the North Fork was reached on May 24, 1948, and the velocity was probably about such as to deliver the water at Portland eight days later, on May 31, or June 1, if not regulated. However, there actually was partial impoundment in Flathead Lake and minor retardation in Pend Oreille and Franklin D. Roosevelt Lakes. The water crested on the North Fork at Columbia Falls on May 23, 1948, but the peak at the gauging station below the outlet of Flathead Lake,

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<sup>12</sup>Avan V. Dunn, Hydrological and Hydraulic Analysis of the Proposed Glacier View Dam Project, Department of Interior, National Park Service, Water Resources Branch, September 10, 1948, Table VIII, p. 17.

near Polson, was not recorded until June 6. This peak did not reach Portland and Vanport until about June 13, or about two weeks after the peak at that point had occurred and passed.<sup>13</sup>

At the peak of the Vanport flood, the total volume of water contributed by the North Fork amounted to 1.1% or approximately the top 3.8 inches of flow on June 1. This is a negligible amount. The flood of Vanport was the result of converging crests from the Snake and Willamette Rivers, and the catastrophe resulted from the failure of a railroad fill which was not designed to serve as a levee.<sup>14</sup> It was not the result of the 3.8 inches of flow from the North Fork of the Flathead.

The table on the next page shows the flow of the three forks of the Flathead during the 1948 maximums. The location of these gauging stations can be found on Map 2, following page 2.

From this table it can be seen that the North Fork supplied but 25.8% of the flow of the Flathead at Columbia Falls, while the South Fork supplied over 40%.

Flathead Lake has already proved adequate to reduce the flood flows from above Columbia Falls by 50%, and to

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<sup>13</sup>Avan V. Dunn, Comments Concerning Hydrological and Hydraulic Features of Proposed Glacier View Dam, Department of Interior, National Park Service, Water Resources Branch, August 27, 1948, p. 1.

<sup>14</sup>Dunn, Hydrological and Hydraulic Analysis of the Proposed Glacier View Dam Project, op. cit., p. 2.

TABLE VI

MAXIMUM DISCHARGES, 1948<sup>15</sup>  
TRIBUTARIES OF THE FLATHEAD

Sta. No.	Discharge Sec.ft.	Date	Percent of flow at Columbia Falls
79	14,600	5/23	--
80	26,400	5/24	25.8% (N. Fork)
81	102,000	5/23	100.0%
83	14,500	5/22	--
84	30,000	--	--
85	32,600	5/23	31.8% (M. Fork)
86	696	5/22	--
89	43,400	5/22	42.4% (S. Fork)

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<sup>15</sup> Department of Interior, Geological Survey, Floods in May-June 1948 in Columbia River Basin, With a Section on Magnitude and Frequency of Floods, Water Supply Paper 1080, (Washington, n. d.), Table 3, p. 280.



defer their crest for two weeks during the flood of 1948.<sup>16</sup> Hungry Horse, when completed, will permit control of approximately 40% of the flow above Columbia Falls through complete control of the South Fork. Recent computations on the maximum carrying capacity of the river channel between Columbia Falls and Flathead Lake indicates that the channel will carry 75,000 cubic feet per second with but negligible overflow.<sup>17</sup> By storing the entire flow of the South Fork in Hungry Horse reservoir, it appears certain that the main river channel could adequately handle the run-off. On the basis of the 1948 flood, which was the greatest in more than fifty years, elimination of the flow of the South Fork would have meant a maximum discharge of only 59,000 cubic feet per second in the main river below Columbia Falls, which is less than 79% of the channel capacity. Combined, these two structures can adequately handle flooding conditions in the Flathead Valley under all but the most unusual circumstances.

In conclusion it should be pointed out that although the Corps of Engineers estimated \$271,400 in local annual flood control benefits, their recent flood damage survey of the Flathead River reported that the average annual damage over the past fifty-year period was only \$58,060.<sup>18</sup>

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<sup>16</sup>Dunn, Hydrological and Hydraulic Analysis of the Proposed Glacier View Dam Project, op. cit., p. 2.

<sup>17</sup>Statement in opposition to the Glacier View Dam, op. cit., p. 3.

<sup>18</sup>House Document No. 643, 78th Cong., 2nd Sess.

The Corps of Engineers' proposal seems to be a gigantic plan on a minor stream designed to accommodate floods of a magnitude never before known to have existed or even approached.

Although the Glacier View Dam is proposed for flood control, it is designed for power generation. The dam is to have a height of 416 feet and a gross capacity of 4,800,000 acre-feet. A drawdown of 35% to a height of 270 feet will leave dead storage of 1,640,000 acre-feet. This dead storage would be adequate for all control of anticipated floods after Hungry Horse is completed. The 416 foot dam, instead of one of 270 feet, is proposed for three purposes. It provides additional head for power; the additional storage is necessary to carry over in the case of a series of dry years; and this additional storage is also necessary to permit a uniform power draft during the dry drawdown period.<sup>19</sup> It is interesting to note that had the dam been built in 1936 and the reservoir filled, a minimum yearly drawdown would have meant that the reservoir would never again have been filled until the flood year of 1948, thirteen years later.<sup>20</sup>

Stated in still another way, during a total storage season of 365 days, with an average river flow of 2,600

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<sup>19</sup> Dunn, Comments Concerning Hydrological and Hydraulic Features of Proposed Glacier View Dam, op. cit., pp. 2-3.

<sup>20</sup> The Glacier View Dam Proposal, Compiled at Glacier National Park, (West Glacier, Montana, January, 1951), p. 2.

cubic feet per second, 1,882,000 acre-feet of water will be stored. With an average drawdown season of 212 days, October through April, and the power house operating at two-thirds capacity drawing 5,160 cubic feet per second, the average annual drawdown will be 2,170,000 acre-feet. This is an annual loss of 288,000 acre-feet. It is easy to see that in eleven years, the 3,160,000 acre-feet of usable capacity will be completely consumed. Then only several flood years averaging much more than the 1928-1942 average, will be able to increase the water level in the reservoir. The only other alternative is to operate one generator, or one-third the plant's capacity to conserve the water. If this is the case, then the installation of three turbines and generators in the power house in the first place is a gross miscalculation.

Proponents of the project point out the high recreational value of the reservoir as an asset. The Corps of Engineers place these benefits at \$60,000 annually. However, it is hard to see where a lake with fluctuating levels would be a recreational asset in an area of hundreds of natural lakes. The acres of mud flats along the entire shoreline would hardly be pleasant, especially after several dry years. The reservoir would also ruin the North Fork stream fishing and float trips offering a thrilling experience that is now attracting nationwide attention.

It has been pointed out that a general decrease in total annual precipitation throughout this area is causing a

glacial recession. Although we are now in such a period the rate of tourist travel to Glacier has not been adversely effected. The people come to Glacier for its rugged mountain scenery and wildlife, not just to see a glacier. Less than .4% of the 1951 record breaking 500,125 visitors set foot on a glacier. This park was not set aside because it contained some mountain glaciers, but because it contained one of the greatest unspoiled samples of mountain glaciation in the country. Probably the single greatest effect this project will have on the park is the despoliation of the entire west side.

Communities immediately adjacent to the project would of course enjoy a temporary benefit during the construction period, which in the case of an earth-filled structure, would be very short. However, the construction families will overtax the local school system causing at least a temporary problem. According to statistics of the Flathead County public schools, enrollment has jumped from 5,257 in 1940 to 6,491 in 1950.<sup>21</sup> The 1950 enrollment is 26.9% greater than that of 1940 and 41.9% greater than that of 1930. It should be noted that the state wide average for this same period shows a decrease of 11.1%. In other words, the enrollment at the Flathead County schools is 53.0%

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<sup>21</sup> Henry L. Pahl, "The Relationship of Total Population, Agricultural Workers, and Farm Holdings to Pupil Enrollment Trends in the Public Schools of Montana for the two Decades Since 1930." (Unpublished Master's thesis, Montana State University, 1952), Appendix I.

higher than the statewide average. Much of this must be contributed to the influx of construction families at Hungry Horse.

The Valley County public school system, when the Corps of Engineers constructed Fort Peck Dam, showed a similar increase for the 1930-1940 period.<sup>22</sup> This increase caused a tremendous overload of the county school system and the reorganization of all the school districts. However, when the dam was completed, the enrollment dropped to where it is now 9.8% below the state average. This burdened the county with excess school equipment and the problem of again reorganizing the school system.

These migratory workers own no property and therefore pay no property taxes other than license fees. The mil levy on the local property holders had to be increased and they footed the bill. Following construction, employees at the dam would be mainly a caretaker or two and revenue to the surrounding communities would be practically nil. If one could imagine the boom town of Hungry Horse or the "Gin Mill Row" at Martin City nestled in the gateway pines of Glacier National Park, he would lose any satisfaction he had gained from his trip in this wild country.

The construction town at its doorway, and the fluctuating lake in its wilderness would create a general sore spot in Glacier from which the park would never com-

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<sup>22</sup>Pahl, loc. cit.

pletely recover.

As far as a fire break is concerned, the reservoir would be of little or no help. The weeds, sedges and rushes growing on these mud flats would be highly combustible during the hot summer days when the fire danger is already high. Comparing the reservoir bottom with that of Lake Sherburne, another irrigation impoundment in the park, is not too practical. Sherburne, located in the Many Glacier area (See Map No. 2), is a small irrigation impoundment authorized before Glacier was established. Prior to flooding, the valley was rocky, thin soiled, and covered with aspen. The exposed bottom, when the water is drawn out, is covered only with shale rock. No combustible growth or stumps are visible. However, the soils of the North Fork Valley are deeper and support more varied growth. When flooded and subsequently exposed, the bottom will support weeds, grasses, and possibly brush. Stumps from the logged over area plus snags and rotten trees will also be present. Trying to cross the lake would be an impossibility since any boat would have to be carried or pushed across these stump and boulder flats nearly a mile to reach the water. Then equal distance of waste would again have to be crossed to reach the other shore. This would give the fire-control personnel more headaches than the valley bottom as it is now.

Probably one of the major reasons why this project should be considered is the effect it will have on the National Park System in general.

Congress, on August 25, 1916, passed the act establishing the National Park Service,<sup>23</sup> specifying that the purpose of national parks is to conserve the scenery, wildlife and the natural and historical objects therein and provide for the enjoyment of the same in such manner as will leave them unimpaired for the enjoyment of future generations.

Placing an area in the National Park System does not result automatically in the complete preservation, however. Periodically the cry about "locked-up reserves" is raised by interested parties. Lumber for veterans' housing was the cry for timber on Olympic National Park to have it turned over to National Forest status.<sup>24</sup> A request to recommend the cutting of mature and overmature forest stands in Mt. Rainier National Park and a proposal to dam Yellowstone Lake in Yellowstone National Park were two items brought up before the Pacific Northwest Regional Planning Commission meeting in Spokane in 1936. Both these petitions were rejected as they might prove to be the first steps in the breaking down of the national parks from their original intent and purpose.<sup>25</sup>

Developments again threatening the National Park System include the flooding of most of Dinosaur National

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<sup>23</sup>Ovid Butler, American Conservation, (Washington, 1935), p. 75.

<sup>24</sup>Department of Interior, National Park Service, Annual Report, Fiscal year ended June 30, 1946, p. 322.

<sup>25</sup>Tom C. Spaulding, personal letter, December 28, 1951.

Monument and parts of Grand Canyon National Monument by power production dams. Another, the planned construction of a fifty-four mile tunnel that would divert the Colorado River under the Kaibab Plateau to a power plant below would reduce the flow of the Colorado River through the Grand Canyon National Park to almost zero.

Glacier National Park was established by the people of the United States through an Act of Congress. The Act of May 11, 1910 stated that the tract of land in the State of Montana was set aside as a public park and pleasure ground for the whole people of the United States. Said park shall be under the executive control of the Secretary of Interior, whose duty it shall be to provide for the preservation of the park and for the care of the fish and wildlife therein. This act safeguarded preexisting land rights permitting the utilization of park areas by the United States Bureau of Reclamation.<sup>26</sup> This provision gave the Bureau of Reclamation the right to complete their previously initiated works on the Two Medicine and Milk River irrigation reservoir projects within the eastern side of the park. There is no evidence to indicate that this provision was ever intended to authorize the use of park lands for a huge hydroelectric power project such as the Glacier View Dam.<sup>27</sup>

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<sup>26</sup>Jenks Cameron, The National Park Service, Its History, Activities, and Organization, (New York, 1922), P. 113.

<sup>27</sup>Newton B. Drury, Excerpts from Effects of the Glacier View Project Upon Glacier National Park, Department of Interior, National Park Service, August 30, 1948.



If the nation permits its national parks to be whittled away piecemeal to satisfy requests for flood control, irrigation, hydroelectric power, lumbering, grazing, mining, and other similar uses, it will have lost forever the superlative areas previous generations rescued. This generation will have broken its pledge to the past and betrayed its trusts to the future if it does not prevent all encroachments that would in any manner detract from the primary values which national parks are dedicated to protect and preserve.

In closing let us regard one more item, that of multi-purpose. Is it possible to build a dam that will, at one and the same time, satisfy the needs of power production, flood control, irrigation, and provide for recreation and wildlife? I do not believe so. It is not likely that a water level established for one particular purpose can be equally satisfactory in meeting all other purposes. In the words of E. L. Palmer, Director of Nature Education of the American Nature Association:

In spite of what politicians tell us, we cannot build a power dam that will be of maximum use for flood control, for irrigation, and also provide . . . facilities for recreation and wildlife.

Whether we like it or not, the possibility of producing salable hydroelectric power is behind most of the major dam projects . . . Some can well be built for this one purpose though flooding lowlands and cities and causing a potential flood menace downstream.<sup>28</sup>

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<sup>28</sup>E. Lawrence Palmer, "On The Level," Nature Magazine Vol. 44, No. 3, (March, 1951), p. 138.

Plates 6 through 9<sup>29</sup> present an amusing yet clearer picture of what is meant by the complications of providing a water level for several different purposes.

On Plate 6 appears what is the ideal water level behind a power dam. Once the level drops, production must be curtailed or a crisis will develop and production will halt completely.

Now with the level high up for steady power production, there can be no impounding flood waters. This can be seen on Plate 7. What is best for power, is poorest for flood control. There is a danger that a group sponsoring a dam being erected for one purpose may, with no justice whatever, advance flood control as a supporting argument for it.<sup>30</sup>

Plate 8 points out that the ideal level for irrigation, navigation, and water supply would approximate the level for power storage. However, if the dam was erected to raise the water level to divert it for irrigation by gravity, then any of the water that went through a turbine for power production would be lost to irrigation.

When public support is sought for a project involving the construction of a dam, another of the arguments is the advantages that will accrue to fish, wildlife, and recreation. Plate 9 shows how the water level should be in

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<sup>29</sup>Palmer, op. cit., pp. 138-143.

<sup>30</sup>Ibid., p. 140.

PLATE No. 6

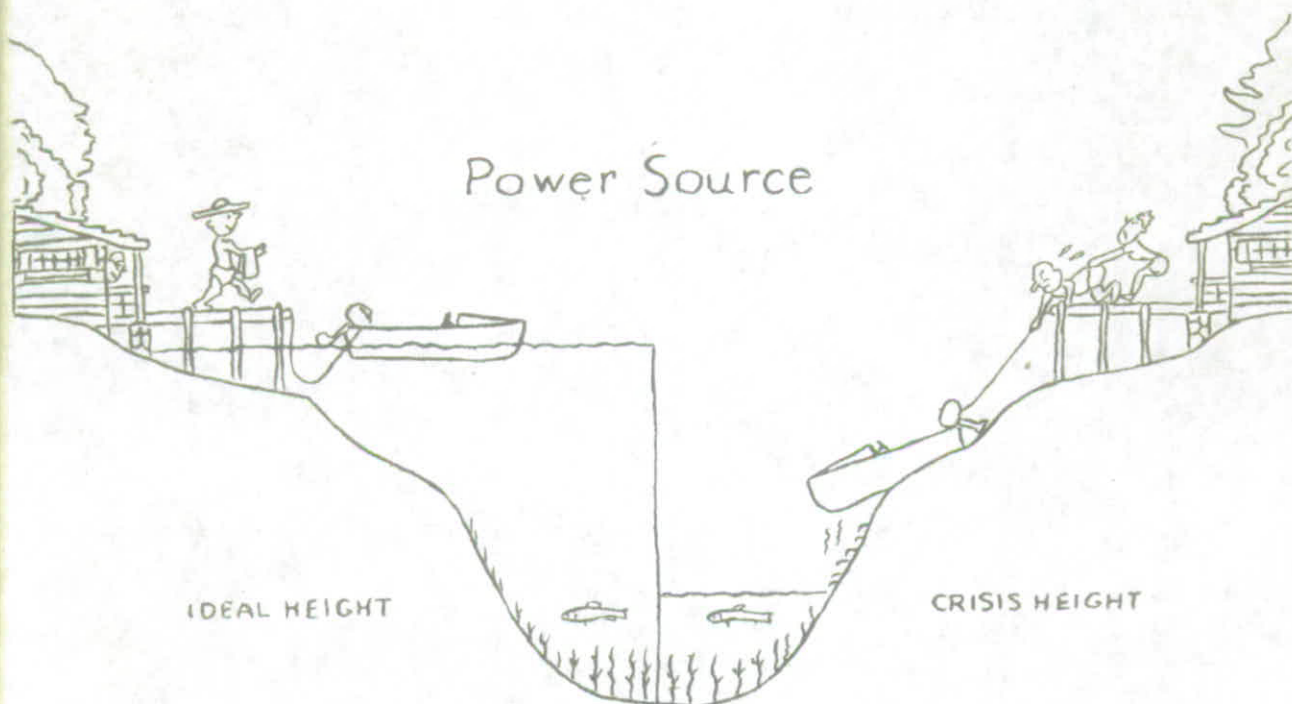


PLATE No. 7

Flood Control

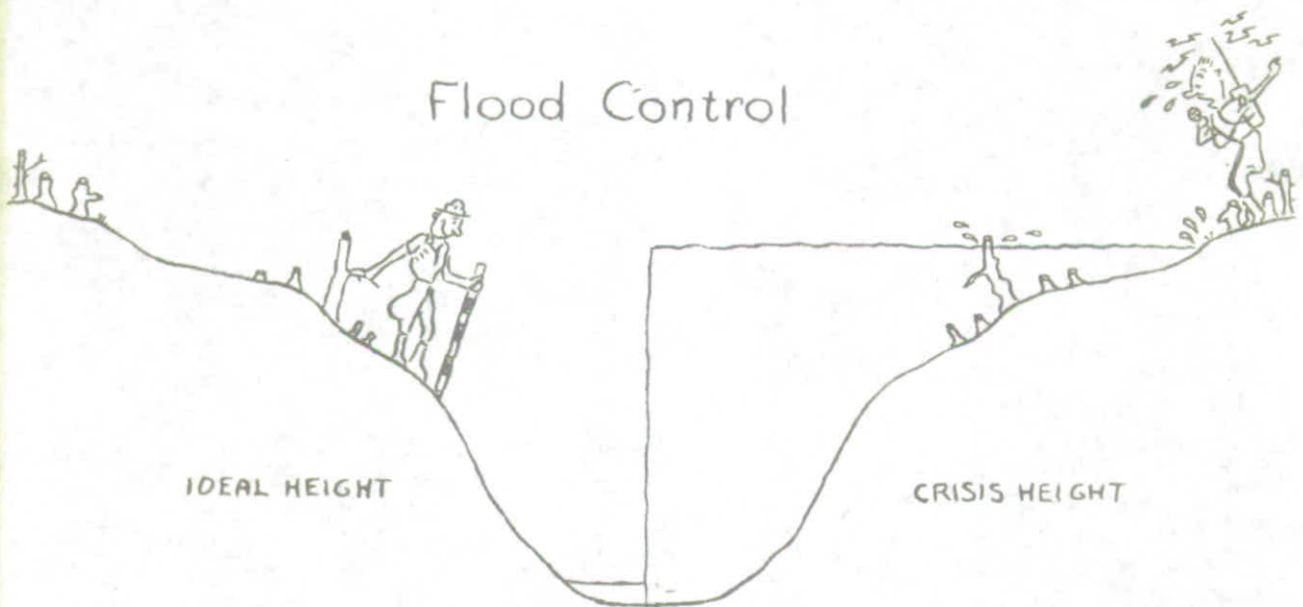


PLATE No. 8

Irrigation and Water Supply

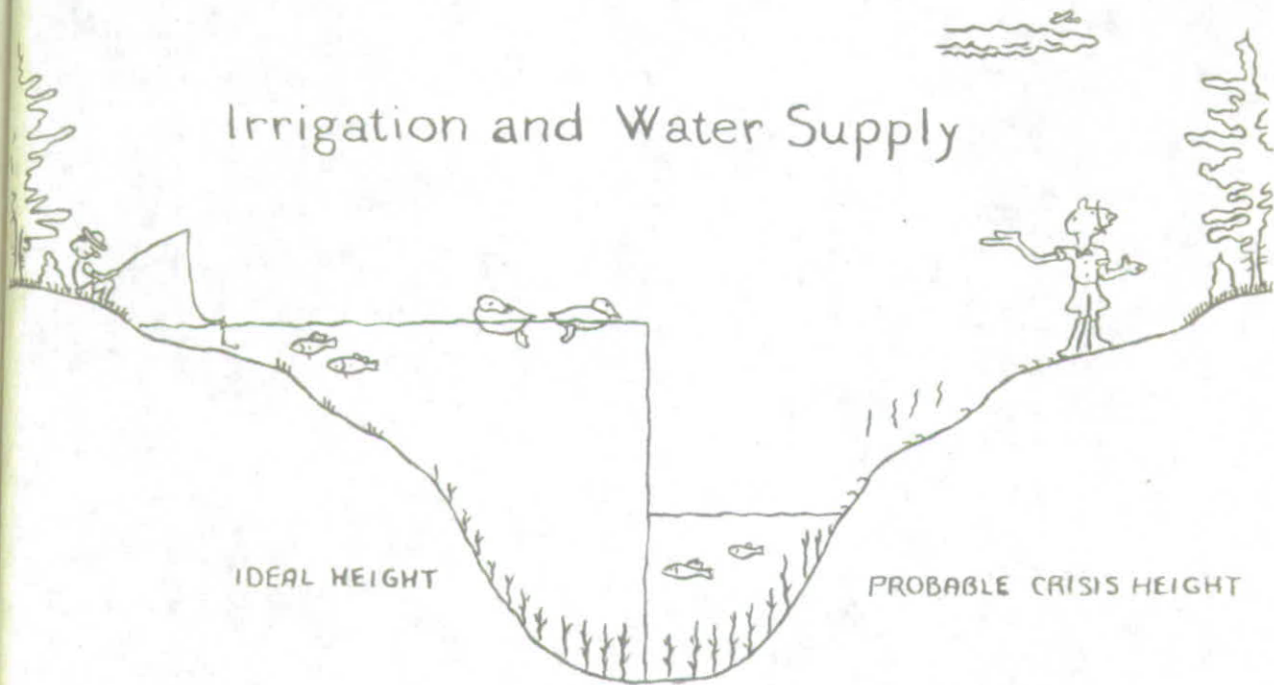
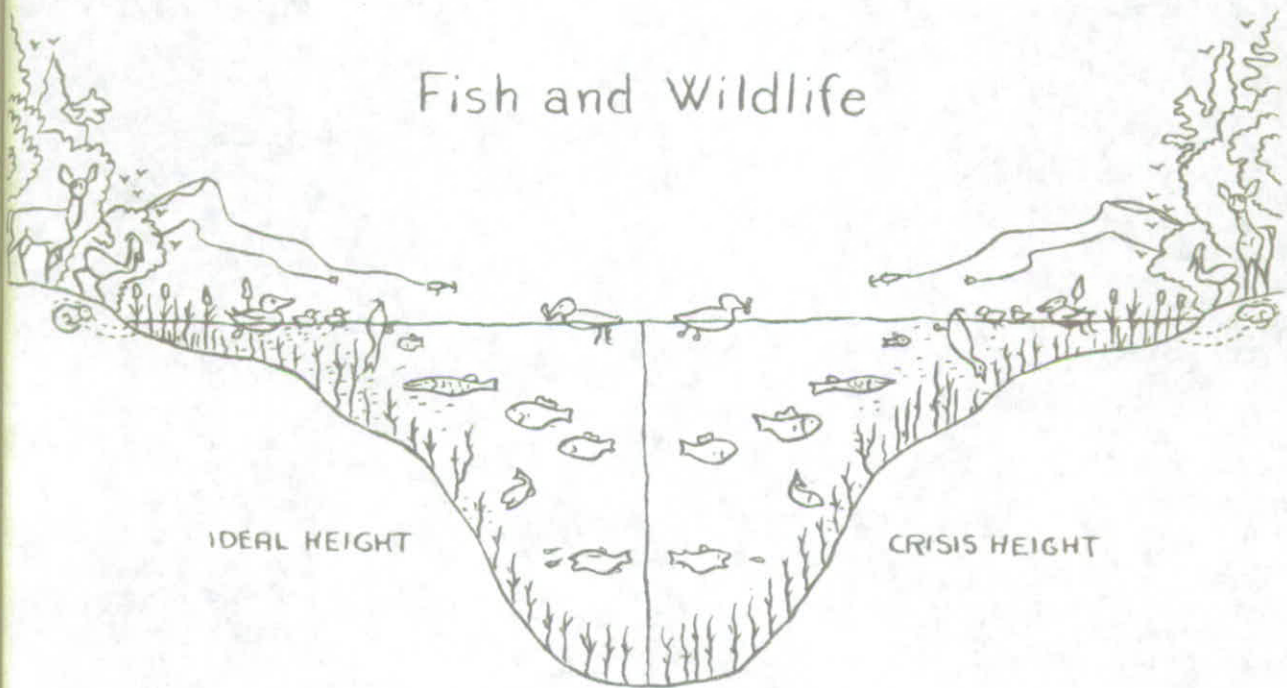


PLATE No. 9

Fish and Wildlife



respect to wildlife. Any fluctuation would be a crisis. Ducks nesting along the shoreline would be wiped out as the flood waters came in. Forest growth would be close to and sometimes far from the waters edge. This would not help the small fur bearers at all. Fish nests at the waters edge would be exposed as the level was drawn down. The release of stored waters should also be adequate to guarantee continuous use of the river by wildlife and fish. Probably the only type of wildlife recreation that would be increased by a dam would be the fishing directly below the tail race of the turbines. Here small fish and feed swept through the wheels would be dumped out attracting the bigger game fish. This would be responsible for an aggregation of anglers at this point which could possibly be termed a recreational benefit.

All projects should be studied to determine in advance their effect on waterfowl habitat. Benefits from fish and wildlife are determined by particular conservation needs and are not expressed in monetary terms. The Fish and Wildlife Service exercises its judgement as to whether benefits will exceed costs once it has been established that a given project will fulfill a given need.<sup>31</sup>

These preceeding paragraphs, in conjunction with the four diagram-cartoons, have been inserted here as a final

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<sup>31</sup>The Report of the President's Water Resources Policy Commission, Vol. 2, Ten Rivers in America's Future, (Washington, Government Printing Office, 1950), p. 33.

thought before any conclusions are drawn. Whenever a project is proposed as multi-purpose, every purpose must be given complete consideration with an open mind before any decision is reached. A flood control project, if operated solely for flood protection downstream, will have little recreational benefit. As soon as the downstream channel can carry the volume, the waters held back by the structure will be dumped in preparation for a subsequent crest. This is especially true in a downstream structure that is fed from several rivers whose crests will come at different times.

If the water will be utilized as fast as it comes into the reservoir, and not any faster, then the lake level will remain constant. If this is the case, then no impoundment was necessary in the first place. Water impoundments are proposed, and generally necessary, when there is a seasonal flow of the river and high water must be stored for dry seasons. These reservoirs have little value in the field of wildlife and recreation.

These points should be kept in mind when the evaluation of potential projects is brought up, especially when advocated as advantageous to recreation.



## CHAPTER IV

### SUGGESTED ALTERNATE PROPOSALS

It would be extremely unfair to condemn a proposal without recommending an alternative. Such is the case with Glacier View. Since the project is proposed and recommended by the Corps of Engineers under their navigation and flood control authority, the alternatives should likewise fall in the flood control category. There are two possibilities. Either suggest another project that will accomplish the same objective or recommend an action that will render the project unnecessary.

Let us first examine the former alternative, that of recommending another project. On Map 1 of the Columbia Basin is the location of several similar projects now under construction. Included are seven that are authorized but as yet not in the construction stage. These projects were authorized by Congress for their flood control and navigation benefits. Power production, although rated highest in dollar benefits, is considered as secondary. Plate 10 gives a more concise summary of those projects in the vicinity of Glacier View and the Flathead Valley.

Along the lower Columbia are located the authorized

John Day and Priest Rapids Dams. The John Day Dam is a multi-purpose project that will provide approximately 2,000,000 acre-feet of flood control storage that will be of great value in reducing river stages and damages downstream during floods. It will also add additional dependable power to the existing Northwest grid system and provide incidental irrigation and recreation benefits. It will provide total average annual benefits of \$22,151,000.<sup>1</sup>

The Priest Rapids Dam is a multi-purpose structure providing a source of hydroelectric power with storage features to provide extensive flood control benefits. Navigation and irrigation facilities will be added at a later date if warranted. The project will yield annual flood control benefits of \$2,763,000 in addition to those from power sales.<sup>2</sup>

Lower Granite Dam on the lower Snake will provide \$90,000 annually to flood control benefits.<sup>3</sup>

Albeni Falls Dam, now under construction on the Pend Oreille River, is a flood control and power production development. It will reduce flood levels on Pend Oreille Lake up to 1.5 feet for some floods of record. Estimated annual flood damages to be prevented amount to \$27,400.<sup>4</sup>

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<sup>1</sup>Department of the Army, Corps of Engineers, The Corps of Engineers in Washington, Prepared by the North Pacific Division, July, 1950, p. 20.

<sup>2</sup>Ibid., p. 26.      <sup>3</sup>Ibid., p. 20.

<sup>4</sup>Department of the Army, Corps of Engineers, The Corps of Engineers in Idaho, Prepared by the North Pacific Division, July, 1950, p. 10.

The Libby Dam on the Kootenai River, is still another authorized multi-purpose structure. It is estimated that the protection works will prevent annual flood damages amounting to \$1,791,900, of which about three-quarters of a million dollars are in the Kootenai Flats area, and the remainder in the lower Columbia Basin. In addition, power benefits will be realized from this project.<sup>5</sup>

The Paradise Dam, recommended but not authorized, is still another in the chain of flood control structures along the tributaries of the Columbia. Peak flow on the Clark Fork at Paradise during the 1948 flood was 135,000 cubic feet per second. This flow combined with 125,000 cubic feet per second flow at Libby, controls ten times the amount of runoff as the North Fork at Glacier View.<sup>6</sup>

Flood control projects that are recommended but not authorized can be found on Plate 10. These are those located in the Glacier View, western Montana vicinity only.

Here then are five authorized projects, one already under construction, that offer a far greater control of floods along the lower Columbia River than does Glacier View. One engineer has reported that flood control effectiveness dwindles the further away a structure is situated

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<sup>5</sup>Department of the Army, Corps of Engineers, The Corps of Engineers in Montana, Prepared by the Missouri River Division, July, 1950, p. 14.

<sup>6</sup>Statement in Opposition to the Glacier View Dam, Prepared at Glacier National Park, (West Glacier, Montana, July 27, 1948), p. 4.

# PLATE No. 10

## DAMS IN THE VICINITY OF GLACIER VIEW AND WHAT THEY CONTRIBUTE TO THE SURROUNDING TERRITORY

NAME OF DAM	LOCATION	DEPT.	TYPE	GROSS RESERVOIR CAPACITY	POWER		IRRIGATION	STREAM FLOW DATA
					KILOWATT OUTPUT	POWER ALLOCATION	AVAILABLE WATER	
GLACIER VIEW CANYON CREEK CORAM	N. FK FLATHEAD	ARMY CORPS of ENGINEERS	POWER, FLOOD CONTROL, STORAGE	4,909,000 ACRE FT.	440,000 KW	BPA	3,160,000 ACRE FT. (GLACIER VIEW ONLY)	2600 SEC. FT. * (GLACIER VIEW ONLY)
KERR	OUTLET of FLATHEAD LAKE	MONTANA POWER Co.	POWER		112,000 KW	BPA AND PRIVATE UTILITIES	FLATHEAD LAKE 1,080,000 ACRE FT.	ABOUT 10,000 SEC. FT.
MILLTOWN	CLARK FORK	MONTANA POWER Co.	POWER		3,000 KW	RESIDENTIAL, MISSOULA, BONNER, DARBY	PONDAGE	2500-3000 SEC. FT. ‡
THOMPSON FALLS	CLARK FORK	MONTANA POWER Co.	POWER		35,000 KW	BPA AND PRIVATE UTILITIES	PONDAGE	ABOUT 18,250 SEC. FT.
BIG FORK	MOUTH of SWAN RIVER	MTN. STATES POWER CO.	POWER		4,150 KW	KALISPELL AND AREA		
HUNGRY HORSE	S. FK. FLATHEAD	BUREAU of RECLAMATION	POWER, FLOOD CONTROL, IRRIGATION	3,500,000 ACRE FT.	285,000 KW	BPA	2,000,000 ACRE FT.	APPROX. 3600 SEC. FT.
ALBENI FALLS	PEND OREILLE	ARMY CORPS of ENGINEERS	POWER, STORAGE	1,540,000 ACRE FT.	42,600 KW	BPA	1,140,000 ACRE FT.	22,400 SEC. FT. *
CABINET GORGE	CLARK FORK	WASHINGTON WATER POWER	POWER		288,000 KW		PONDAGE	19,090 SEC. FT. *
LIBBY	KOOTENIA	ARMY CORPS of ENGINEERS	POWER, FLOOD CONTROL	6,100,000 ACRE FT.	980,000 KW	BPA	4,250,000 ACRE FT.	10,920 SEC. FT. *
KATKA	KOOTENIA	ARMY CORPS of ENGINEERS	POWER	1,350,000 ACRE FT.	552,000 KW	BPA	PONDAGE	12,560 SEC. FT. *
NOXON RAPIDS	CLARK FORK	WASHINGTON WATER POWER	POWER	55,000 ACRE FT.	200,000 KW		PONDAGE	19,090 SEC. FT. *
TROUT CREEK	CLARK FORK	MONTANA POWER Co.	POWER	92,000 ACRE FT.	292,000 KW		PONDAGE	19,090 SEC. FT. *
PARADISE	CLARK FORK	ARMY CORPS of ENGINEERS	POWER, FLOOD CONTROL, NAVI- GATION, STORAGE	6,520,000 ACRE FT.	1,008,000 KW	BPA	4,080,000 ACRE FT.	16,850 SEC. FT. *
QUARTZ CREEK	CLARK FORK	ARMY CORPS of ENGINEERS	POWER	46,000 ACRE FT.	123,000 KW	BPA	PONDAGE	5100 SEC. FT. *
NINE MILE PRAIRIE	BLACKFOOT	ARMY CORPS of ENGINEERS	POWER, FLOOD CONTROL, STORAGE	1,230,000 ACRE FT.	74,000 KW	BPA	960,000 ACRE FT.	979 SEC. FT. *

BLACK - EXISTING STRUCTURES  
 GREEN - AUTHORIZED OR UNDER CONSTRUCTION  
 RED - PROPOSED

DATA FROM: ARMY CORPS OF ENGINEERS REVIEW REPORT  
 ON COLUMBIA, APPENDIXES B AND C, TABLES 38 AND 39.  
 OTHER MATERIAL FROM BUREAU OF RECLAMATION  
 AND THE MONTANA POWER COMPANY.

\* MEAN ANNUAL DISCHARGE  
 (1928 - 1942)  
 ‡ AVE. OF PAST 15 YRS.

from the locality needing protection. He further stated that flood control reservoirs located well upstream are chiefly valuable for protecting towns and farms in the valleys immediately below them.<sup>7</sup> In the case of Glacier View then, it would be useful chiefly in the protection of Kalispell and the Flathead Valley. It is felt that Hungry Horse Dam can accomplish this.

Property damage in the Columbia Basin in the 1948 flood was \$102,725,000, more than half of which was in the Portland, Vanport Area.<sup>8</sup> If we add up the estimated annual flood control benefits of these preceeding five projects, we have a total of \$26,827,400. This is a little over 26% of the 1948 flood damage in the Columbia Basin. Adding Glacier View's annual flood control benefits of \$639,000, will only raise the percentage six-tenths of one percent. Adding Glacier View's regional flood control benefits only would raise this percentage four-tenths of one percent.

An engineer of the Soil Conservation Service, soon after the 1948 flood, reported:

The damage in 1948 was due to man's encroachment upon the flood plain of the river in the course of fifty-four years . . . therefore, future floods of comparable magnitude can be expected . . .<sup>9</sup> in vulnerable areas throughout the Columbia Basin.

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<sup>7</sup>Gerard H. Matthes, "How Good is Flood Control?" Engineering News-Record, Vol. 147, No. 19, (November 8, 1951), p. 33.

<sup>8</sup>Ibid., p. 31.

<sup>9</sup>Ibid.

Experience records in this country, and longer experience abroad, demonstrate that permanent and complete control can rarely be achieved for either physical or economic reasons. So long as people continue to establish homes and factories in the natural pathways of floods, and so long as they are permitted to encroach on river channels, so long will flood control remain ineffective and undependable.<sup>10</sup>

The need for proper flood control is recognized. However, it is felt that the indiscriminate damming of all the upstream tributaries of the Columbia does not provide the answer. It is treating a result rather than a cause. Much of the rapid upstream runoff is due to burned and logged over areas incapable of absorbing quantities of water or slowing the melting of snow. Consideration should be given watershed protection activities such as reforestation, regrassing, and small stream checks. This is treating the cause rather than the result. It has long been known that good forests, good soils, and good water go hand in hand. It is the improper use of the land that upsets the ecological balance between soil, water and vegetation.

In the case of the 1948 flood in the Columbia Basin there simply was too much water from melting snow and rain even for nature's vast soil reservoir to hold it all back. But without the trees and other vegetation the flood would

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<sup>10</sup>Matthes, op. cit., p. 33.



have been larger and more destructive. During the peak of the flood it was reported that snow stayed much longer in timber than on bare slopes. Clearly, the high mountain forests, although they too were losing their snow cover, were still holding back much water. Clearly, too, the great stretches of high mountain land lacking their former forest cover had more quickly released their water to add to the flood that was raging downstream.<sup>11</sup>

Floods cannot be controlled by building higher and higher levees or permanently by building dams if other things are neglected. The big streams are fed by small streams and water control inevitably leads us back to the proper conservation of forests and agricultural land.<sup>12</sup>

It seems only fitting to insert here part of the testimony submitted by Winton Weydemeyer, Master of the Montana State Grange, at the Army Corps of Engineers Glacier View hearing at Kalispell on May 25, 1948.

The proposal to dam the North Fork of the Flat-head is in perfect harmony with the national water policy we have been following, of treating results rather than causes. Throwing dams across our streams is in too many cases only an emergency measure, instituted to overcome in part the results of abuse to our watersheds. Here is the pattern we follow, the blueprint for our folly; we cut down the forests which form Nature's water reservoirs faster than they grow; we allow burned watershed areas to lie

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<sup>11</sup>U.S. Department of Agriculture, Forest Service, How Forest Conditions Affected the 1948 Columbia River, (Washington, Government Printing Office, 1950), pp. 1, 6-7.

<sup>12</sup>The Report of the President's Water Resources Policy Commission, Vol. 1, A Water Policy for the American People, (Washington, Government Printing Office, 1950), p. 2.

idle and eroding; we overgraze the grasslands upon which the rain falls; as a result, there occurs rapid runoff of water from rain and melting snow, with accompanying soil erosion and silting of our streams and reservoirs. When floods occur, do we hasten to protect the lands from whence the water flows? No, instead we pour more concrete or dirt across the silt laden streams. Is this the remedy, when we allow the silt to still flow, to settle in the reservoirs and . . . eventually destroy their usefulness?<sup>13</sup>

Mr. Weydemeyer further stated at this hearing that he has flown over the Valley of the North Fork. He reported seeing mile after mile of burned over and barren eroding land. He reported that the Montana State Grange feels that in general the dam building program should be slowed down in favor of more attention to watershed protection activities.<sup>14</sup>

The National Forests, on whose streams and rivers many of these dams are proposed, were set aside for the expressed purpose that Mr. Weydemeyer stated; that of watershed protection. These lands are dedicated to the management policy of the "greatest good for the greatest number." Included in this policy are the terms stating the reasons these forests were first established. The Act of June 4, 1897, establishing Forest Reserve boundaries stated:

. . . no public forest reservation shall be established except to improve and protect the forest within the reservation, or for the purpose of

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<sup>13</sup> Grange Takes Stand on Glacier View Dam, Testimony of Winton Weydemeyer, Master of the Montana State Grange, presented at the Corps of Engineers public hearing at Kalispell, Montana on May 25, 1948.

<sup>14</sup> Ibid.



securing favorable conditions of water flows, and to furnish . . . timber . . . for the citizens of the United States.<sup>15</sup>

A joint letter sent by the Secretaries of Agriculture and Interior to the President and approved on February 10, 1910, defined the character of the lands contemplated by the Act of 1897 as:

Lands wholly or in part covered with brush or other undergrowth which protects stream flow or checks erosion on a watershed of any stream important to irrigation, water power, or to the water supply of any city, town, or community, or open lands on which trees are grown, should be retained within the National Forest.<sup>16</sup>

This was the first point in defining lands for National Forests. The three that followed pertained to the production of trees and timber. The Act of March 1, 1911, known as the Weeks Law, authorized the Federal Government to purchase lands for National Forests where they would be instrumental in protecting the watersheds of important navigable streams.<sup>17</sup> This was the law that resulted in the purchase of all of the National Forest lands east of the Mississippi. In every case the primary reason behind the establishment of a National Forest was the protection of the watersheds therein.

However, with government projects based on flood control, power, irrigation, and navigation, the project

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<sup>15</sup>Department of Agriculture, Forest Service, The Use Book, A manual of Information About the National Forests, (Washington, Government Printing Office, 1918), p. 10.

<sup>16</sup>Ibid., p. 11.

<sup>17</sup>Ibid., p. 167.

costs are minimized. The government favors projects whose dollar benefits are in excess of dollar costs and accrue soon after installation. Dams and reservoirs are such projects. In the case of Glacier View, the benefit cost ratio is 1.84 to 1 (See page 17). Projects whose benefits are not predominantly monetary are given minor roles, or found "uneconomic." Watershed protection and soil restoration fall into this category. Simply stated, it "pays" to treat the "symptoms" of watershed disease (e.g., to catch debris behind big dams). It does "not pay" to attempt to cure the disease at its source, the eroding uplands themselves.<sup>18</sup>

Here are the alternatives then. First, begin construction of these five authorized and other recommended flood control structures. They have a far greater effect on the control of floods along the lower Columbia than would Glacier View. Second, invest the money in watershed protection for which the National Forests were originally established instead of investing it in projects whose lives may not be long enough to write off the costs. Until the people's viewpoint is changed or re-educated in the ideas of watershed restoration, however, this second alternative will have little support.

A second argument for the construction of the Glacier View Dam is its necessity for power production at

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<sup>18</sup>Morris L. Cooke, A Water Policy for the American People, Report of the President's Water Resources Policy Commission. Reviewed by Bernard Frank in The Living Wilderness, No. 36, (Spring, 1951), pp. 21-2.

site and downstream. The outlook for industrial expansion in the Flathead Valley is promising. However, Hungry Horse, which will produce 285,000 KW, can certainly fulfill any need for power in this local area. The rugged terrain of the valley does not lend itself to much more industrial expansion. On a regional level it is true there is a great need for more electrical power. Yet these same five projects that are previously mentioned as flood control measures, are well equipped to fulfill any need for power in the near future. The three navigation projects authorized on the lower Snake plus McNary and Chief Joseph Dams now under construction on the lower Columbia are also main power producers. Washington Water Power is building the Cabinet Gorge Dam on the Clark Fork, still another to add to the northwest power pool. All these structures will be interconnected in the Bonneville Power Network and are capable of transmitting power to any corner of the entire Pacific Northwest. Table VII shows the total annual output of these potential power plants.

From this table it can be determined that 7,701,600 KW will be available upon completion of these structures. Of this, 3,543,600 KW or 46% is already in the construction stage and will be expected in the near future. The power from Glacier View, including Canyon Creek and Coram, is 440,000 KW, or 5.7% of the authorized or 12.4% of the expected power pool. If power production is the only need, this small percentage does not warrant the construction

TABLE VII

KILOWATT OUTPUT OF POTENTIAL HYDROELECTRIC  
PLANTS IN THE BONNEVILLE POWER NETWORK<sup>19</sup>

Name	Location	Authority*	KW Output	Status <sup>#</sup>
John Day	Columbia	F. C.	1,105,000 <sup>#</sup>	Auth.
McNary	Columbia	Nav.	1,200,000 <sup>#</sup>	U. C.
Priest Rapids	Columbia	F. C.	1,219,000	Auth.
Chief Joseph	Columbia	Nav.	1,728,000	U. C.
Ice Harbor	Snake	Nav.	227,000	Auth.
Lower Monumental	Snake	Nav.	211,000	Auth.
Little Goose	Snake	Nav.	230,000	Auth.
Lower Granite	Snake	F. C.	186,000	Auth.
Albeni Falls	Pend Oreille	F. C.	42,600	U. C.
Cabinet Gorge	Clark Fork	Pow.	288,000	U. C.
Libby	Kootenai	F. C.	980,000	Auth.
Hungry Horse	Flathead	Recl.	285,000	U. C.

\* Authority - Reason project is authorized  
F. C. - Flood Control  
Nav. - Navigation  
Pow. - Private Power  
Recl. - Bureau of Reclamation,  
including flood control<sup>20</sup>

<sup>#</sup> Status - Auth. - Authorized  
U. C. - Under Construction

<sup>#</sup> Estimated

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<sup>19</sup>Data from; Department of the Army, Corps of Engineers, The Corps of Engineers in Washington, op. cit., The Corps of Engineers in Idaho, op. cit., The Corps of Engineers in Montana, op. cit.

<sup>20</sup>According to The Report of the President's Water Resources Policy Commission, Vol. 2, p. 20, interim plans are being made annually through cooperation of the Bureau of Reclamation, the Corps of Engineers, and other irrigation organizations for the use of irrigation reservoirs for flood control. Through this Columbia Basin Inter-Agency Committee, plans were developed for the operation of Hungry Horse in conjunction with other downstream structures.

of Glacier View and the subsequent destruction of Glacier National Park's wilderness and wildlife.

It should be noted here that the Bureau of Reclamation has several plans for future hydroelectric developments in the immediate Flathead area also. These include three generating plants on the Flathead River just below Kerr Dam, having a total output of 159,000 kilowatts. Their plans also call for additional installations at Kerr Dam which will double this plant's 56,000 KW output. Reclamation plans also call for an eight mile diversion tunnel from the Middle Fork to the South Fork of the Flathead above Hungry Horse Dam. This tunnel will have a 450 ft. head at its outlet capable of still additional power production.<sup>21</sup> If these plans materialize, the Flathead Valley area will certainly be rich in power potential.

Should there ever come a time in the future of the Flathead Valley when more power is needed for expansion, it can still be brought in on the Bonneville Power Net which is already constructed in the area.

Additional power in the form of natural gas lies only a few miles across the International border in British Columbia. Natural gas fields are also in production in the Cut Bank area just east of Glacier National Park. Here are two more possibilities for bringing power to the Kalispell,

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<sup>21</sup> Department of Interior, Bureau of Reclamation, The Columbia River, Final Letters of Transmittal and Comments of the Affected States and of Federal Lands, House Document 473, 81st Congress, Vol. 1, February, 1950, p. 201.

Flathead Valley area without the construction of Glacier View.

A third argument favoring construction of the project is the irrigation benefits that will accrue. On Table I, Chapter II, the additional irrigable lands have been listed. They total 55,539 acres. In addition to this, the Kalispell Project, involving about 85,000 acres north of Flathead Lake, is also available for irrigation. This total of 140,539 acres is the maximum additional land in this area that can be put under irrigation. Hungry Horse Dam, built by the Bureau of Reclamation under its land reclamation authority, has 2,000,000 acre-feet of water available for irrigation. This volume of water could irrigate these remaining acreages to a depth of 14.2 feet. It is obvious that in an area where irrigation is used mainly to supplement normal rainfall,<sup>22</sup> such a volume would take on the aspect of a flood not unlike that which the Corps of Engineers is authorized to prevent.

Another point for consideration is the soil and topography of the land to be irrigated. The soil is a glacial till which is very poorly drained. Water stands on many of the fields through late spring because of this poor drainage. The topography is gently rolling and the area is

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<sup>22</sup>George Sunborg, The Economic Base for Power Markets in Flathead County, Montana, Department of Interior, Bonneville Power Administration, Division of Industrial and Resources Development, Market Analysis Section, October, 1945, p. 36.

full of sink holes. It would be next to impossible to level this land prior to irrigating. The bulldozers, in leveling, would fill the sink holes with top soil and expose the sub soil and rock on the hummocks. It took five elections to get a Soil Conservation District established in Flathead County because it was thought this would bring on irrigation. The farmers do not need and do not want irrigation in Flathead County.

It should be noted that once an irrigation project is developed it cannot be moved because unfavorable soil or climate factors are discovered. Therefore, any irrigation benefits accruing from the Glacier View project would be exceedingly questionable.

We have found that the Glacier View project will contribute six-tenths of one percent to the total flood control benefits of the Columbia Basin and 5.7% of the power to the Northwest power pool. There does not seem to be any need for irrigation water in addition to that from Hungry Horse Dam.

With these points in mind, we will evaluate the benefits and effects, and present them as conclusions in the next chapter.

## CHAPTER V

### AN EVALUATION OF THE NEEDS AND EFFECTS

The Glacier View Dam project has been proposed and recommended by the Army Corps of Engineers as a major storage development. It will bestow numerous benefits to the people of the local Flathead Valley area and to all the people of the Pacific Northwest. These benefits include local and regional flood control, power production, irrigation, navigation and recreation. The project will flood nearly 30,000 acres of land, submerging forever much of the wilderness area of Glacier National Park, wiping out the winter ranges of most of the park's wildlife, and starting the first inroads into the National Park System that have been fought so vigorously since its establishment.

These are the points that must be considered when the evaluation of the problem is undertaken.

First, it is now felt that the needs for a flood control project of such size is entirely unwarranted in this remote area. The crest of the North Fork of the Flathead is delayed so long that it arrives downstream where the damage is greatest about two weeks after that downstream crest has passed. In the flood of 1948, the flow of the



North Fork contributed 11,127 cubic feet per second or but 1.1% of the total flow of the flooded Columbia at the downstream flooded areas. This negligible amount does not warrant the construction of a \$102 million dollar flood control structure at the Glacier View Site.

There are six flood control projects now authorized on the Columbia River and tributaries, two already under construction, that will contribute much more to regional flood control than Glacier View. In the flood of 1948, had these six projects been completed, they would have reduced flood damages by 26%. Had the Glacier View project also been completed the damages would have only been reduced another four-tenths of one percent.

The channel of the Flathead River above Flathead Lake has a measured capacity of 75,000 cubic feet per second with but negligible overflow. By storing the entire flow of the South Fork behind Hungry Horse Dam, the total flow of the river will then be less than this capacity. On the basis of the 1948 flood, the greatest in fifty years, elimination of the flow from the South Fork would have reduced the flow in the main Flathead to 59,000 cubic feet per second or but 79% of the channel capacity. This means that Hungry Horse is capable of handling any flood in the Flathead Valley, rendering Glacier View again unnecessary.

A recent Corps of Engineers bulletin on the average flood damages of the Flathead River over the past fifty years reported annual damages of \$58,060. Yet their claim

of annual local flood control benefits from the Glacier View project is \$271,400. This benefit is 368% greater than their report of annual flood damages in the same area.

The Army Engineers, at hearings in Montana, have advocated the construction of upstream dams, yet at later hearings in other downstream states they have discounted the economics of upstream dam construction. The following statement from the Spokane Spokesman-Review for July 24, 1948 directly quotes Mr. Bertram P. Thomas, civilian engineer, Seattle Branch, Army Corps of Engineers, as follows:

After consideration of hundreds of potentialities, I say to you with confidence, there is not a single truly headwater potentiality on the two main tributaries on the Columbia in Montana that will meet the requirements both as to physical and economic feasibility.<sup>1</sup>

Such inconsistency on the part of these Engineers does not justify much faith in many of their statements. Their reports of vague benefits such as improved standard of living, national security, and business stabilization, seem to indicate they have no hesitancy in support of their project.

Second, it is felt that the only justifiable reason for the support of this project is its power potential. The Glacier View project, in conjunction with Canyon Creek and Coram, will produce a maximum of 440,000 KW. Glacier View will supply 210,000 KW, Canyon Creek and Coram 230,000

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<sup>1</sup>The Spokesman-Review, July 24, 1948.

KW combined. The operation of Canyon Creek and Coram will be dependent upon the release of stored water from Glacier View which will be operated from October through April, 212 days. The rest of the season, 153 days, the project will be storing flood waters and will not be in operation. Therefore, when water is being impounded at Glacier View all three power plants will be shut down. This is assuming, of course, that the project will be operated under the plan as it is now proposed. Another point to bear in mind, when Glacier View is in full operation, it will probably run at only two-thirds capacity since even at this rate, more water will be used up than stored.

Therefore, the entire project will produce 370,000 KW instead of 440,000 KW and will be in operation only 56% of the time each year. Since five hydroelectric projects are already under construction in the Pacific Northwest that will add 3,543,600 KW to the regional power pool, the power from Glacier View will only increase this pool by 10.5%. The project will increase the authorized power pool by only 4.8%. These small additions do not warrant the authorization and subsequent construction of this project.

Third, the irrigation benefits from this project are unnecessary. There are only 140,549 additional acres of land than can possibly be irrigated in the entire Flathead Valley, the only farming country in the vicinity. These acreages can quite easily be irrigated by Hungry Horse Dam, now being constructed by the Bureau of Reclamation.

Fourth, the recreational benefits derived from this project are highly questionable. It is very hard to see where an annual income of \$60,000 can be expected from a large fluctuating body of water, especially in an area of hundreds of natural lakes.

Fifth, from the standpoint of Glacier National Park, the project will be highly detrimental. The reservoir will destroy the wilderness aspect of the entire west half of the park. It will flood out up to 70% of the white-tail deer winter range, 30% of the elk and mule deer winter range, and destroy entirely 80% of the moose range. In addition, 70% of the beaver habitat would be inundated. The reservoir would also wipe out 8,000 acres of virgin timber including the last remaining stands of ponderosa pine in this region. During the several years of construction work, the borrow pits, construction town, and general disruption would be something from which the park would never fully recover.

Sixth, the Glacier View project proposal will be in direct opposition to the ideals of the National Park Service under whose jurisdiction lies the protection of Glacier National Park. Such a proposal threatens the entire National Park System whose policies have been established by the people of the United States through Congress. They are policies of complete protection; in fact, they must now be considered preservation. These National Parks are different in character, purpose, and management from any other Federal holdings and cannot be integrated into plans in which the

basic purpose is the direct economic utilization of the natural resources. It is the considered and firm viewpoint of the National Park Service that not only should these areas be kept free of water control structures, but also that the planning of water resource programs must halt at their boundaries.<sup>2</sup> Once the breach is made, there is no telling how far the proponents of "complete utilization" of these "locked-up resources" may go. Congress has repeatedly made plain its intentions that the National Parks and Monuments be kept free of any use which would modify or destroy natural conditions, scenic beauty, or wildlife.

The Federal Water Power Act, passed in 1920, failed to provide protection to the Parks and Monuments against use for power projects. Ammended in 1921, the act exempted the then existing parks. It was further ammended in 1935 to extend this exemption to all which might be established thereafter.<sup>3</sup> The Glacier View proposal would be an outright violation of this act.

In conclusion, I believe the benefits of this proposal have been highly exaggerated, and have been proposed during a period of flood hysteria. It is indeed unfortunate that we must be faced with a destructive flood before our

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<sup>2</sup>Department of Interior, National Park Service, Water Resources and the National Park System, Prepared at Glacier National Park, (West Glacier, Montana, n. d. ), p. 2.

<sup>3</sup>"News Item of Special Interest", The Living Wilderness, No. 34, (Autumn, 1950), p. 40.

thoughts turn to the need for flood control. However, as long as we mismanage our forests and grasslands, and as long as the flood plains of our rivers are encroached upon, we will have floods. The need for control is great. But I feel there is greater control in our forests, our creeks and streams, than in the swollen rivers at springtime. If we can hold the snow back in the woods and hold the water in the creeks, then our problem is solved. As our timber and soil is managed, so must our water be managed.

The need for water power is great, particularly in the resource-rich Northwest. However, I only hope the current plan will not force our power supply into the hands of politicians under the guise of flood control.

In its National Parks and Monuments, our country has been left a great heritage. Let us not commercialize every last remnant of it. Let us leave something for our sons, something our fathers left us.

In August, 1950, Representative Mike Mansfield of Montana introduced H.R. 6153 authorizing the Army Corps of Engineers to build the Glacier View Dam. Previously the Secretaries of Interior and Army agreed on its elimination from the present plans for the Columbia River Basin. The bill was referred to the House Committee on Public Works, which to this date, has not acted on it.<sup>4</sup>

Any further action is up to you, the reader.

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<sup>4</sup>Department of Interior, National Park Service, Annual Report, Fiscal year ended June 30, 1950, p. 306.

## BIBLIOGRAPHY

- Adams, Warren Duane. "An Analysis of Montana's Public School Enrollments from 1930-1950 and Projected Enrollments 1951-1960." Unpublished Master's thesis, Montana State University, 1952.
- Anthony, H. E. Field Book of North American Mammals. New York: G. P. Putnam's Sons, 1928.
- Atwood, Wallace W. "Glacier National Park in Danger." National Parks Magazine, Vol. 23, No. 96, (January-March, 1949), 10-17.
- Butler, Ovid. American Conservation. Washington: The American Forestry Association, 1935.
- Cameron, Jenks. The National Park Service, Its History, Activities, and Organization. New York: D. Appleton and Co., 1922.
- Cooke, Morris L. A Water Policy for the American People. Report of the President's Water Resources Policy Commission. Reviewed by Bernard Frank in The Living Wilderness, No. 36, (Spring, 1951), 21-4.
- Drury, Newton B. Effects of the Glacier View Project Upon Glacier National Park. Department of Interior, National Park Service. Mimeographed; August 30, 1948.
- Dunn, Avan V. Comments Concerning the Hydrological and Hydraulic Features of the Proposed Glacier View Dam. Department of Interior, National Park Service, Water Resources Branch, [Washington], August 27, 1948.
- . Hydrological and Hydraulic Analysis of the Proposed Glacier View Dam Project. Department of Interior, National Park Service, Water Resources Branch, [Washington], September 10, 1948.
- Facts About the Glacier View Dam. [Prepared in Glacier National Park. Typewritten; West Glacier, Montana], n. d.

The Glacier View Dam Proposal. Compiled in Glacier National Park. Typewritten; West Glacier, Montana, January, 1951.

Hanson, P. D. Forests, Dams and People. U.S. Department of Agriculture, Forest Service, Northern Region. Presented before the meeting of the Columbia Basin Inter-Agency Committee, Kalispell, Montana, May 9-10, 1950.

Hoflich, H. J. and Beatty, M. E. Glacier National Park Visitors in Montana--1949. Bureau of Business and Economic Research. Missoula: Montana State University, May, 1950.

House Bill 62, Montana State Legislature, February, 1951.

House Document No. 643, 78th Congress, 2nd Session.

Matthes, Gerald H. "How Good is Flood Control?" Engineering News-Record, Vol. 147, No. 19. (November 8, 1951) 30-3.

"More Dams, More Ruined Fishing." Outdoor Montana, (April-May, 1948), 12.

Munns, E. N. "Our Forests and Watersheds." Scientific Monthly, Vol. 67, (November, 1948), 346-354.

Murie, Olaus J. "The Defense of Forest Recreation Areas Against Overambitious Irrigation, Flood Control, and Water Power Projects." Journal of Forestry, Vol. 48, No. 1, (January, 1950), 38.

"News Items of Special Interest." The Living Wilderness, Vol. 13, No. 25, (Summer, 1948), 21-8.

"News Items of Special Interest." The Living Wilderness, No. 34, (Autumn, 1950), 40.

Pacific Northwest Problems and Materials. Portland: Northwest Regional Council, 1940.

Pahl, Henry L. "The Relationship of Total Population, Agricultural Workers, and Farm Holdings to Pupil Enrollment Trends in the Public Schools of Montana for the Two Decades Since 1930." Unpublished Master's thesis, Montana State University, 1952.

Palmer, E. Lawrence. "On The Level." Nature Magazine, Vol. 44, No. 3, (March, 1951), 137-144.



Pertinent Facts about the Glacier View Dam Project. [Compiled at Park Headquarters, Glacier National Park. Typewritten; West Glacier, Montana], n. d.

Proceedings of the Fifth Pacific Northwest Regional Planning Conference. Pacific Northwest Regional Planning Commission, National Resources Committee, Region No. 9. Seattle, April 27, 28 and 29, 1939.

The Report of the President's Water Resources Policy Commission. Vol. 1, A Water Policy for the American People. Vol. 2, Ten Rivers in America's Future. Washington: Government Printing Office, 1950.

Rognrud, Merle J. "Flathead-Sun River Unit, Early Spring Inspection, South Fork of the Flathead River," Montana Fish and Game Commission Quarterly Report, (April-June, 1948).

———. "Investigation of the White-tailed Deer in the Swan River," Montana Fish and Game Commission Quarterly Report, (October-December, 1950).

Ruhle, George C. Guide to Glacier National Park. Minneapolis: Campbell-Mithum, Inc., 1949.

State of Montana Lands in Glacier National Park. [Prepared in Glacier National Park, Mimeographed; West Glacier, Montana], n. d.

Statement in Opposition to the Glacier View Dam. Prepared at Glacier National Park. Typewritten; West Glacier, Montana, July 27, 1948.

The Status of Wildlife in the U.S. Report of the Special Committee on the Conservation of Wildlife Resources. Senate Report No. 1203, 76th Congress, Washington: Government Printing Office, February 13, 1940.

Sunborg, George. The Economic Base for Power Markets in Flathead County, Montana. Department of Interior, Bonneville Power Administration, Division of Industrial and Resources Development, Market Analysis Section, [Washington], October, 1945.

Tilden, Freeman. "The Life Community: An Interpretation of the National Parks." The Living Wilderness, No. 36, (Spring, 1951), 3-10.

U.S. Department of Agriculture, Forest Service. How Forest Conditions Affected the 1948 Columbia Flood. Washington: Government Printing Office, 1950.

- U.S. Department of Agriculture, Forest Service. The Use Book. A Manual of Information About the National Forests. Washington: Government Printing Office, 1918.
- [U.S.] Department of Interior, Bureau of Reclamation, The Columbia River. Final Letters of Transmittal and Comments of the Affected States and Federal Agencies, House Document, 81st Congress, Washington, February, 1950.
- [U.S.] Department of Interior, Geological Survey, Floods in May-June 1948 in Columbia River Basin, With a Section on Magnitude and Frequency of Floods. Water Supply Paper 1080, Washington, n. d.
- [U.S.] Department of Interior, National Park Service, Annual Report. Fiscal year ended June 30, 1946.
- [U.S.] Department of Interior, National Park Service. Annual Report. Fiscal year ended June 30, 1948.
- [U.S.] Department of Interior, National Park Service. Annual Report. Fiscal year ended June 30, 1950.
- U.S. Department of Interior, National Park Service. Water Resources and the National Park System. Prepared at Glacier National Park. Mimeographed; West Glacier, Montana, n. d.
- [U.S.] Department of the Army, Corps of Engineers. Review Report on Columbia River and Tributaries. 1 volume, 9 appendixes, [Washington], October 1, 1948.
- [U.S.] Department of the Army, Corps of Engineers, The Corps of Engineers in Idaho. Prepared by the North Pacific Division, July, 1950.
- [U.S.] Department of the Army, Corps of Engineers, The Corps of Engineers in Montana. Prepared by the Missouri River Division, July, 1950.
- [U.S.] Department of the Army, Corps of Engineers, The Corps of Engineers in Washington. Prepared by the North Pacific Division, July, 1950.
- Watts, Lyle F. "Can We Save Our Wilderness Areas?" The Living Wilderness, No. 32, (Spring, 1950), 9-11.

Weydemeyer, Winton. Grange Takes a Stand on Glacier View Dam. Testimony of W. Weydemeyer, Master of the Montana State Grange, presented at the Corps of Engineers public hearing at Kalispell, Montana, May 23, 1948.

Yard, Robert Sterling. "Going to Glacier?" National Parks Magazine, No. 86, (July-September, 1946), 3-4.

Zajanc, Ade. "Lincoln County Game Study, 1947-1948," Montana Fish and Game Commission Quarterly Report, (April-June, 1948).